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MARINE BIRDS OF THE SOUTHEASTERN UNITED STATES AND GULF OF MEXICO

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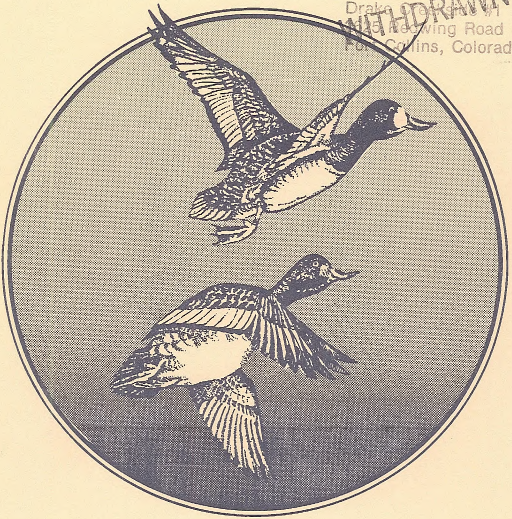

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by

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National Museum of Natural History
Washington, D.C. 20560

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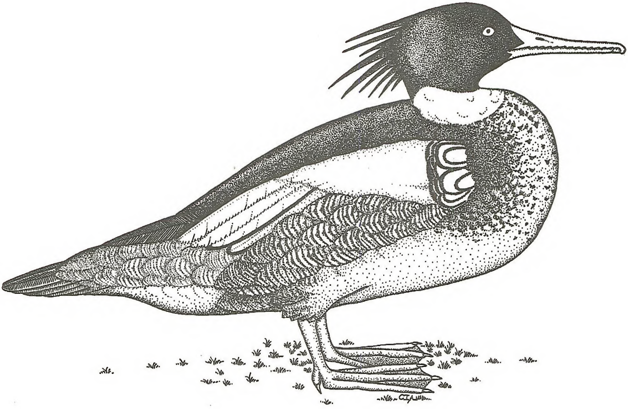

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PREFACE

Part II of the volumes Marine Birds of the Southeastern United States and Gulf of Mexico, published by the National Coastal Ecosystems Team, provides a synthesis and analysis of information about marine birds in this area. Accounts for 41 species include information on distribution, abundance, and susceptibility to oil pollution. More detailed information on distribution in the southeast and a summary of food habits and habitats utilized are presented for 17 species. Information on breeding ecology is summarized for 12 species that we think are most likely to be affected by oil pollution. Selected bibliographies follow each species account and include additional sources of information.

Any suggestions or questions regarding this report should be directed to:

Information Transfer Specialist
National Coastal Ecosystems Team
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NASA-Slidell Computer Complex
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ABSTRACT

Information on the seasonal distribution and abundance of 41 species of waterfowl of the order Anseriformes that occur in the coastal southeastern United States has been compiled and mapped from the literature. In many instances this provides the first synthesis of knowledge about a species for this region. For the species we consider most important in coastal areas we also provide information on world-wide distribution, habitat, food, and various aspects of life history. This information was gathered in an attempt to assess the possible effects of offshore oil development on populations of marine birds in the southeast.

The susceptibility of birds to oil depends not only on their juxtaposition in time and space, but also on currents and climatic factors and on the stage of the life or annual cycle and the behavior of the species. Contamination by oil may result in matting of the feathers with death following from chilling, starvation, and the ingestion of oil during preening. Among the birds covered by this report, the sea ducks and diving ducks are considered the most susceptible to oil pollution in the southeast. Most of the other ducks, geese, and swans covered in the report are relatively insusceptible to oil pollution because they are seldom found in areas where oiling is likely to occur.

One of the conclusions reached by this report is that we know very little about the status and populations of some of the anatids that occur in the southeast. Some of these species (e.g., the scoters) are among those that may be expected to be most detrimentally affected by development of oil resources. In general, most species that are widely hunted are relatively well studied, but much is unknown of those that are not game birds.

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ABBREVIATIONS USED IN TEXT

Most of the abbreviations used in the text are in standard use and will be known to the reader; a few may be less familar. These are listed below with a brief indication of their interpretation.

N, S, E, W, (capitalized without period)	compass directions
N., S., E., W. (capitalized with period)	geographic site designation (e.g., S. Padre Island)
ac	acre
ad.	adult
AOU	American Ornithologists' Union
BOU	British Ornithologists' Union
BLM	Bureau of Land Management
ca	(circa) about
CBC	Christmas Bird Count
cf.	(confer) compare/see
coll.	collected
comp.	compiler
Co.	County
CSLP	Center for Short-lived Phenomena
EBBA	Eastern Bird Banding Association
et. seq.	and the following
ha	hectare
IBBA	Inland Bird Banding Association
imm.	immature
in litt.	in the letters (of)
in prep.	in preparation
ms	manuscript
n	sample size
Natl. Park	National Park
Natl. Seashore	National Seashore
nonad.	nonadult
NWR	National Wildlife Refuge
op. cit.	(opere citato) in the work cited
Par.	Parish
pers. comm.	personal communication
pers. observ.	personal observation
photogr.	photographed
prep.	preparer
SD	Standard Deviation
spec.	specimen
sp./spp.	species (sing./plu.)
St. Park	State Park
subad.	subadult
subseq.	subsequent
unpubl.	unpublished
USFWS	United States Fish and Wildlife Service
WAGBI	Waterfowlers Association of Great Britain and Ireland
WMA	Wildlife Management Area

Units of measurement in the text are presented as they were in the source from which they were derived and are followed by parenthetical conversion to the metric or English systems, as appropriate.

PURPOSE OF REPORT

The purpose of this report is to summarize the status of waterfowl in the southeastern United States and explore the potential effects on these species of the development of petroleum resources on the outer continental shelf (OCS). This entailed a review of available information in order to:

1) determine where and when waterfowl occur in marine areas to be developed for oil and gas production;

2) ascertain which species would be most at risk from oil and the development of oil resources;

3) evaluate the importance of populations in the southeastern United States in relation to the entire distribution and abundance of the species;

4) summarize information on the life history of species most likely to be adversely affected by development of oil resources.

This material is presented in a form that enables the Bureau of Land Management (BLM) to identify aspects of OCS development that might threaten populations of marine birds. It provides information that will aid managers in making decisions that minimize damage to these populations during the development of energy resources.

A corollary objective is to recommend topics for future research in areas for which information is particularly scarce.

STUDY AREA

The study area encompasses the coastal and offshore waters of the southeastern United States, from the northern border of North Carolina to the Mexican border. A wide variety of coastal habitats occurs within this area: sandy barrier islands; fresh, salt, and brackish marshes; open beach; coastal bays; dredge spoil islands; mud-flats; and mangrove islands. The dominant habitats of sections of the coastline will be discussed below.

HABITATS

North Carolina is dominated by a series of fringing barrier beaches behind which lie large estuaries with extensive areas of shallow water and salt marsh. These fringing islands (the Outer Banks) are farther (30-50 km or 20-30 mi) from the mainland than are such islands along other areas of the Atlantic coast (Warinner et al. 1976). Extensive stands of salt marsh with deep tidal channels are found south of Cape Lookout, North Carolina, through South Carolina and Georgia. Almost three-quarters of the salt marsh acreage along the Atlantic seaboard is found in these three states. The largest areas of salt marsh on the Atlantic coast are in Georgia, which has 193,000 ha (477,000 ac), North Carolina

(64,000 ha or 158,000 ac), and South Carolina (176,000 ha or 435,000 ac)(West 1977).

Barrier islands are also very important coastal habitat in these three states. The land areas of the barrier islands for each state are 120,000 ac (48,000 ha) in North Carolina, 124,000 ac (50,200 ha) in South Carolina, and 153,000 ac (62,000 ha) in Georgia (Warner 1976), for a total of about 397,000 ac (160,000 ha). The area of water behind these islands becomes smaller to the south (Warinner et al. 1976). These three states (North Carolina, South Carolina, and Georgia) respectively have about 266 mi (428 km), 199 mi (320 km), and 98 mi (158 km) of open beach along their barrier islands. In other parts of the study area (e.g., parts of the Florida Gulf coast), beaches are few or nonexistent (Woolfenden and Schreiber 1973).

The east coast of Florida is dominated by a chain of barrier islands occasionally broken by tidal passes. Typically, these islands are sandy along their outer perimeters. Large areas of marsh and estuarine swamp lie landward of these islands (Warinner et al. 1976) and salt marshes gradually give way to mangrove swamp (Reimold 1977). Much of the Gulf coast of Florida is dominated by salt marshes and mangrove swamps (Wariner et al. 1976). Open beach is extensive from Naples on the Florida peninsula north along the panhandle to Alabama (Woolfenden and Schreiber 1973). In Alabama, tidal salt marsh, sandy beaches, and offshore islands are common coastal landforms. Mississippi's Gulf coast consists almost entirely of barrier islands that have salt marshes in their centers. The shoreline of Mississippi is extensively developed but still contains fresh, salt, and brackish marshes (Warinner et al. 1976). Only a limited amount of salt marsh is found between northern Florida and Mississippi. Most marshes are small, disjunct, and in alluvial pockets protected by bay shores (West 1977).

Louisiana has more marsh and estuarine area than any of the other United States except Alaska (Warinner et al. 1976) and contains nearly half the total acreage of salt marsh in the contiguous United States. In some places the marshes extend inland as much as 40-50 km (25-30 mi)(West 1977). The coastline along the western third of the state is sandy, but the rest of the area is dominated by barrier islands and marsh that are strongly influenced by the enormous amounts of mud and silt deposited by the Mississippi River (Warinner et al. 1976). The Louisiana coast is one of the most productive areas for marine birds in the continental United States and supports enormous wintering populations of waterfowl.

The coast of Texas makes up a large portion of the western shore of the Gulf of Mexico. Sandy beaches and offshore barrier islands are abundant. Two semi-landlocked lagoons, the Upper and Lower Laguna Madre, and a large low-salinity estuary, Sabine Lake, are areas of great importance to wintering waterfowl. An estimated 78% of the world's population of Redhead ducks winters in the Laguna Madre, and 13% of the world's shrimp harvest comes from Texas waters (Warinner et al. 1976). A limited amount of salt marsh is present in Texas along bay shores enclosed by offshore bars (West 1977).

CLIMATES

The climatic regime, like the landform, differs widely from one part of the study area to another. The northeastern portion is the coldest. The lowest midwinter temperatures along the coast of North Carolina are on the order of 20°F (-7°C) and the average daily maximum during midsummer along the extreme southern coast is only 86°F (30°C), some 6°F less than is usually recorded in the interior. July is the wettest month and October the driest. Along the coast, snow and sleet usually fall only once or twice a year and are usually associated with northeasterly winds. Prevailing winds in North Carolina blow from the southwest most of the year and from the northeast in September and October (Hardy 1974). The weather along the coast of South Carolina is similar to that in North Carolina with some variation. Average annual temperatures along the South Carolina coast are about 68°F (20°C), with an average daily maximum in July of 88°F (31°C) and average daily minimums in January from 35°F (1.7°C) in the northeast to 42°F (6°C) in the southeast. March is particularly rainy along the coast, and October and November are the driest months. Prevailing winds in South Carolina are from the southwest and south in spring and summer, predominantly from the northeast in autumn, and from the northeast and southwest in winter (Landers 1974).

The climate in Georgia is characterized by short mild winters and warm humid summers. The coastal area becomes progressively drier and warmer from north to south. Peak periods of precipitation occur in winter and early spring; the average annual rainfall ranges from 75 in (190 cm) in the extreme northeastern part of the state to 53 in (135 cm) along the lower east coast. Average summer temperatures range from 73°F (23°C) in the extreme north to 82°F (28°C) in parts of south Georgia; average temperature for the three winter months ranges from 41°F (5°C) in the north to 56°F (13°C) on the lower east coast. Areas in northern Georgia have freezing temperatures during the day for almost a third of the year but the lower coast only has about ten days of freezing temperatures annually (Carter 1974).

Florida has a wider range of climate than any other state in the southeast. The climate ranges from temperate to subtropical in the north, to tropical in the Florida Keys. Summers are warm, humid, and long, and winters are mild and brief. Rainfall is abundant, especially from June to September. Mean annual temperatures range from the upper 60's (F) in northern Florida to the mid-70's in the south and reach nearly 78°F (26°C) at Key West. Rainfall varies widely from area to area and from year to year, with most areas usually receiving between 50-65 in (127-165 cm). The drier Keys have an average annual rainfall of only about 40 in (100 cm). On the southern part of the peninsula, prevailing winds are from the southeast and east; elsewhere they are more erratic but tend to be from the north in winter and from the south in summer. Tropical storms frequently cause great damage; few years pass without a hurricane affecting part of the state (Bradley 1974).

The Gulf has a maritime tropical climate with mean winter temperatures of about 70°F (21°C) and mean summer temperatures of 84°F (29°C). Relative to seasons in other parts of the study area, both summer and winter are hot and humid; humidity is greatest during spring and summer and lowest during late fall and winter (BLM 1978a). Rain occurs fairly evenly throughout the year along the eastern and northern Gulf, with a peak from June through August (BLM 1978a). The peak tends to be later farther east and falls in August and September (BLM 1978b). The area becomes progressively wetter from the southwest to the north and central portions of the northern Gulf. The driest area of the Texas coast extends from Brownsville north to about Corpus Christi; the most humid area from Galveston to the Sabine River (Chaney et al. 1978). Average annual precipitation ranges from about 69 cm (27 in) at Brownsville to 137 cm (54 in) at New Orleans (BLM 1978a) and 170 cm (67 in) in Mobile (BLM 1978b).

Tropical storms and hurricanes that often ravage coastal habitats are regular during late summer and fall and enter the Gulf largely through the Yucatan Channel and Straits of Florida (BLM 1978a). Southeasterly winds predominate over the northern Gulf during the summer. Easterlies are more common during the winter, and prevailing winds from the west and southwest are rare at any time of year (BLM 1978a).

METHODS

Most of the information was obtained by a standard literature search. Additional information on oiling of individual species of birds and their distribution was obtained through examination of museum specimens and interviews, but these were not major sources. Several computerized information retrieval systems were investigated but the data did not meet our needs. These sources were particularly weak on the local distribution of birds, much of which is to be found in regional journals not covered by computer services; the temporal coverage was also inadequate for this study. Visual searches of periodicals "proved far more productive from the standpoint of both numbers of citations and thoroughness of the search", as Bartonek and Lensink (1978) pointed out in a review and bibliography of the literature of marine birds of Alaska.

We obtained literature citations primarily by scanning the literature and by consulting bibliographies in relevant papers. The primary sources for the journals, books, and papers were the libraries and reprint files of the Bird Divisions of the Smithsonian Institution, Washington D.C. and the American Museum of Natural History, New York. Other major sources of information were the library of the Department of the Interior, the Library of Congress, and the Bird Library and reprint files of the Patuxent Wildlife Research Center, Laurel, Maryland. The Welder Wildlife Foundation, Sinton, Texas, and the library of government publications and reports maintained by the National Coastal Ecosystems Team, Slidell, Louisiana, were particularly rich sources of information otherwise difficult to obtain. Unpublished reports and papers were obtained from: the Florida Audubon Society, Vero Beach; the Florida Fish and Game Commission, Gainesville; and Everglades National Park, Homestead; and other individuals listed in the acknowledgments. Several dozen valuable but unpublished theses were obtained from several educational institutions.

Searches were made of several secondary sources of literature citations. Literature review sections of major ornithological journals, particularly The Auk, The Ibis, and Bird-Banding, were especially useful, as was Wildlife Review. We also made extensive use of Current Contents, Oil Pollution Abstracts, and

Dissertation Abstracts. Biological Abstracts, Ecological Abstracts, and the Zoological Record were also consulted but were less efficient sources of information. All state bird journals dealing with the southeastern United States (see list below) were scanned; these journals, along with American Birds (Audubon Field Notes in earlier volumes), provided much of the information on local distribution in each state.

We placed considerable emphasis on recentness of information in the literature search. A few journals (e.g., Wilson Bulletin, Bird-Banding) were examined for at least 30 years into the past, The Auk from 1930 to the present. Many others, depending on the degree to which they yielded useful information, were scanned for only a few recent years. We covered the foreign literature as thoroughly as possible. Most of the species treated in this report have a wide geographic distribution, and much of what is known of their breeding biology is to be found only in foreign periodicals. The linguistic limitations of the authors, as well as the temporal and fiscal limitations involved in the production of this report, precluded full use of this material.

Listed below are the serial publications covered extensively. Where appropriate, those areas of the world that these journals cover most thoroughly are listed in parentheses.

Acta Ornithologica (Poland, U.S.S.R.)
Alauda (France, French Africa)
Animal Behavior
Ardea (western Europe)
Atoll Research Bulletin
Auk (North America, world)

Alabama Birds
American Birds (Audubon Field Notes) (United States, Canada)
Atlantic Naturalist (Delaware to Virginia)
Australian Bird Watcher

Behaviour
Bird-Banding (Journal of Field Ornithology)(United States)
Bird Study (Great Britain)
British Birds
Bulletin of the Kansas Ornithological Society
Bulletin of the Texas Ornithological Society

Biologia (Bratislava) (Seria B) (Czechoslovakia)
Biotropica
Blue Jay (central Canada)
Bulletin of the British Ornithologists' Club (world)
Bulletin of the Oklahoma Ornithological Society

California Fish and Game
Canadian Journal of Zoology
Chesapeake Science (Estuaries) (U.S. Atlantic coast)
Dansk Fugle (Denmark)
Ecology
Ekologia Polska (Poland)

Canadian Field-Naturalist
Chat (North and South Carolina)
Condor (North America, neotropics)
Corella (Austalian Bird-Bander)
Dansk Ornithologisk Forenings Tidsskrift (Denmark)
Elepaio (Hawaii)

El Hornero (Argentina)
Fauna (Oslo) (Norway)
Florida Naturalist
Gerfaut (western Europe, Africa)

Emu (Australia, New Guinea)
Florida Field Naturalist
Florida Scientist
Ibis (Old World, Africa)

Jack-Pine Warbler (Michigan)
Journal of Animal Ecology
Journal of Applied Ecology
Journal of Wildlife Management (N. America)
Journal fur Ornithologie (Germany, world)
Journal of Ecology
Kingbird (New York)

Larus (Yugoslavia, eastern Europe)
L°Oiseau et la Revue Francaise d°Ornithologie (France, world)
Limosa (Netherlands)
Loon (Minnesota)
Louisiana Ornithological Society News

Marine Pollution Bulletin
Mississippi Kite
Murrelet (Pacific northwestm Alaska, western Canada)
Notornis (New Zealand, Pacific islands)
Maryland Birdlife
Mississippi Ornithological Society Newsletter
Nos Oiseaux (France, western Europe)

Oikos (Denmark, Scandinavia)
Ornis Fennica (Finland, Baltic area)
Der Ornithologische Beobachter (Switzerland, middle Europe)
Ostrich (South Africa)
Oriole (Georgia)
Ornis Scandinavica (Scandinavia, Finland)
Ornithologische Mitteilungen (world)

Proceedings of the Louisiana Academy of Science
Revue Suisse de Zoologie (Switzerland, central Europe)
Proceedings of the Annual Conference Southeastern Association of Game and Fish Commissioners (southeastern U.S.)

Ring (Europe, world)
Rivista Italiana di Ornithologia (Italy)
Scottish Birds
Southwestern Naturalist (southwestern U.S.)
Suomen Riista (Finland, Baltic area)
Ringing & Migration (Great Britain, world)
South Australian Ornithologist
Soviet Journal of Ecology
Sterna (Norway)

Texas Journal of Science
Transactions of the North American Wildlife and Natural Resources Conference
Die Vogelwarte (western and central Europe)
Wilson Bulletin (North America, world)
Zoologichesky Zhurnal (U.S.S.R.)
Tori (Japan)
Var Vagelvarld (Sweden)
Vestnik Zoologi (U.S.S.R.)
Western Birds (western U.S.)
Wildfowl
Zeitschrift fur Tierpsychologie

The reprint files of several institutions were a particularly fertile source for some undistributed material. The most useful of these were the files of the National Fish and Wildlife Laboratory, the Bird Division of the National Museum of Natural History, the American Museum of Natural History, and the Bird Library of the Gabrielson Laboratory of Patuxent National Wildlife Research Center.

In all, about 10,000 citations dealing directly with the species treated are included in the three parts of this report. Perhaps an additional 1,000 more general articles are listed in the Literature Cited sections at the end of the three volumes.

ARRANGEMENT AND CONTENT OF SPECIES ACCOUNTS

Waterfowl are among the most studied species of birds, and the technical and popular literature on this group is tremendous in volume and scope. Three major works (Johnsgard 1975; Bellrose 1976; Palmer 1976a, 1976b) on North American waterfowl were published in the past decade. Each of these works provides information on life history, distribution, status of populations, and other aspects of waterfowl biology. Each also approaches the study of waterfowl in a different way (Weller 1977) and to some extent is based on a different set of primary literature, although there is a great deal of overlap. Another source (Cramp et al. 1977) summarized what is known of waterfowl in waterfowl in Europe, the Middle East, and North Africa. Many of the species covered by Cramp et al. also occur in North America. We relied heavily on these works in the preparation of this report, both for their informational content and as a guide to the primary literature. However, we supplemented these summaries with literature that has appeared since their publication and that provides some kinds of information that none of these works fully explored.

The accounts for the 41 species included in this section of the report vary considerably in length and in detail. Twenty-four of the species covered are either uncommon in the southeastern states or are found there primarily in fresh water. Because these species, for reasons of geographic distribution or habitat selection, form a very insignificant part of the marine avifauna of the southeast and because their populations would not be threatened by development of energy resources along the coast, their accounts are much abbreviated: we present only a short synopsis of the status and distribution of the species, with emphasis on the southeastern states, and a statement about the potential effects of development of petroleum resources offshore. We present a full bibliography for each of these species.

Seventeen species of waterfowl treated herein are either important members of the fauna of the southeastern United States or are species (e.g., Oldsquaw [Clangula hyemalis]) known to be highly susceptible to oil pollution elsewhere. For these species, we provide more detailed accounts.

SPECIES INCLUDED

None of the waterfowl treated here are truly pelagic in the sense of occurring primarily far offshore. Most of the species for which we provide full accounts are found primarily in the open sea or on large embayments while wintering in the southeastern states or passing through on spring and fall migrations. Many sea ducks and diving ducks tend to congregate into large rafts when feeding or resting, making them vulnerable to oil pollution. Other species included here frequent inshore areas or coastal marshes primarily, where their vulnerability to contamination may be indirect, by contamination of food resources. Other species occur almost solely on fresh water in coastal areas and are quite unlikely to suffer any direct effect from oil pollution.

This report includes accounts for 41 of the 53 species of ducks, geese, and swans that we know have been reported in the coastal southeastern states.

Species that have been excluded occur only accidentally in the southeast. Records for eight (West Indian Whistling Duck [*Dendrocygna arborea*], Red-breasted Goose [*Branta ruficollis*], Ruddy Shelduck [*Tadorna ferruginea*], Baikal Teal [*Anas formosa*], Falcated Teal [*Anas falcata*], Garganey [*A. querquedula*], Mandarin Duck [*Aix galericulata*], Muscovy Duck [*Cairina moschata*]) of the eleven species excluded are likely based on escaped captive birds. Two other species that we have not included stray into the southeast only rarely, one from the north (Barrow's Golden-eye [*Bucephala islandica*]) and the other from the Caribbean (White-cheeked Pintail [*Anas bahamensis*]). We have also excluded the Smew (*Mergus albellus*) because the record from Louisiana is believed to be unsatisfactory (Palmer 1976b). The remaining species excluded, the Trumpeter Swan (*Cygnus buccinator*), formerly wintered along the Texas and Louisiana coasts but is no longer found there (Palmer 1976a).

Nearly half the species treated here occur primarily in freshwater habitats in the southeast. Most of the rest occur primarily in marine and coastal areas or are found widely on both fresh and salt water in the southeast. Some of these, primarily freshwater species (e.g., Mallard [*Anas platyrhynchos*], Common Pintail [*Anas acuta*]), occur in the southeast in extremely large numbers during winter and others (e.g., Lesser Scaup [*Aythya affinis*], Redhead [*Aythya americana*]) are of considerable economic importance because they are major game bird species.

Two species treated more fully (Black Duck [*Anas rubripes*] and Canvasback [*Aythya valisineria*]) are on the most recent Blue List (Tate 1981), a list that attempts to identify species declining in all or part of their range. The Black Duck is seriously threatened by genetic swamping by populations of Mallards (*Anas platyrhynchos*) now breeding in the eastern United States (Tate 1981), and the Canvasback is a much hunted species whose harvest is being carefully regulated by the Fish and Wildlife Service.

SCIENTIFIC AND VERNACULAR NAMES

The species accounts are headed by the English and scientific names of the species, followed by vernacular names in other languages and alternative names in English. The primary English names and scientific names are based on those used by the American Ornithologists' Union Check-list (AOU 1957) and its supplements (AOU 1973, 1976). Footnotes explain recently adopted changes in scientific names. The arrangement of species within the family Anatidae follows the revised edition of Volume I of Peters' *Check-list of Birds of the World* (Johnsgard 1979).

The primary source for most of the non-English vernacular names was the *Nomina Avium Europaearum* (Jorgensen 1958); other sources consulted included Dement'ev and Gladkov (1952), Austin and Kuroda (1953), Edwards (1972), and Cramp et al. (1977). The abbreviations for the languages and other geographical usages appearing in this section are as follows:

DA: Danish
DU: Dutch
EN: English (Old World)
IC: Icelandic
IT: Italian
JA: Japanese
PR: Portuguese
RU: Russian
SAf: South African

FI: Finnish
FR: French
GE: German
NW: Norwegian
NZ: New Zealand
PO: Polish
SP: Spanish
SW: Swedish
US: United States

With few exceptions, the foreign language common names are those in the widest use in the ornithological literature of the countries indicated. In several instances we have included transliterated names from languages in which Roman characters are not used (Japanese, Russian). For Japanese names we have relied on Austin and Kuroda (1953) and for Russian names we have supplied the names used in translations of Dement'ev and Gladkov (1952).

A major reason for providing these alternative names is to assist future literature searches based on retrieval of citations by computer. In both the Old and New World literature, species treated in a paper are sometimes indicated in the title only by the vernacular names which are often used as keywords in computer retrieval systems. In addition, some of the English translations of foreign language names (which are those entered on computers) imply a different species than the name would normally suggest to a reader of English or cannot be readily associated with an English name. As a result, searches of computer literature systems by scientific name alone may fail to indicate important notes or papers that document recent changes in distribution.

We supply alternative scientific names widely or recently in use as another aid to searches of literature compiled on computers. The Caspian Tern appears in recent literature as *Sterna caspia*, *Sterna tschegrava*, *Hydroprogne tschegrava*, and *Hydroprogne caspia*, as well as with *caspius* as a variant of the specific epithet. One computer search we made revealed no less than four different lists of titles when each scientific name was used as a keyword. Such differences in taxonomic usage might well cause confusion when computer-based retrieval of ornithological information is attempted for a wide geographic area. On the other hand, when the translated foreign name is one of widespread use in English speaking countries we have not bothered to list it.

In some instances we have listed more than one vernacular name for a foreign language; this is particularly true for Spanish, in which vernacular names may vary considerably from area to area. The means by which this report was produced precluded a highly accurate rendering of foreign words which incorporate characters or accents not available in our production process. As a result, there are lapses in our orthography, particularly for Icelandic and the Scandinavian tongues.

GENERAL DISTRIBUTION

This section is divided into two parts, one giving occurrence in North America, the other occurrence elsewhere in the world. Most of this information was taken from standard distributional works, but we supplemented this material where possible with more recent literature. Breeding and wintering ranges are emphasized in this section, with less information given on areas of occurrence during migration; material relating to North America is more detailed and more complete than for other areas of the world.

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

In this section we present more detailed remarks on distribution in the southeast. We incorporated as much recent information through 1979 as we were able to obtain. This section is based on the most recent state ornithological handbooks and check-lists, and includes information from a search through seasonal observations published in American Birds and state journals. It also includes information from a number of unpublished manuscripts dealing with distribution in various sections of the southeast. This section also incorporates information on seasonal occurrence, breeding status and numbers, and occasionally brief remarks on habitats. The emphasis is on coastal areas, but in some cases remarks are also made about status elsewhere in the state. Available data for some species are unsatisfactory, incomplete, or extremely scanty. This is particularly true for transients whose numbers are seldom recorded.

Information is given in order by state from North Carolina south and west to Texas; we did not list states in which a species has not been recorded.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

This section in the species accounts summarizes information given in the previous sections, often with additional data on population levels in the coastal southeastern United States. Some additional information on the world-wide status of the species may be included, depending on our present knowledge of the species.

We show distribution of waterfowl wintering in coastal areas on a series of maps. Most of these maps are based on Bystrak (1974), whose report was based on an analysis of National Audubon Society Christmas Bird Counts (CBC) for one or more of the years from 1970 to 1972. We chose 45 of 58 coastal Christmas Bird Counts in the study area and compiled 5-year means for 1973-1977. In some instances fewer than five years of counts were available and the mean is for a shorter period. We picked the localities to show geographic variation in numbers and to emphasize where the largest concentrations were found.

These figures should not be construed as indicating the true size of local populations. The Christmas Bird Counts varied considerably in the amount of estuarine, coastal, and marine habitat covered, but we tried to allow for this by choosing counts that contained the most marine habitat. We realize that the numbers reported in any given year may not be precise because of the limitations of Christmas Bird Counts. We intend these maps to serve primarily as an index of where winter concentrations are likely to be found and to show how this distribution varies throughout the southeast.

HABITAT

This section usually consists of brief remarks dealing with nesting, feeding, and winter habitats. As in other sections in the species accounts, the extent and detail of information reported depends on the relative importance of the species in the southeast.

FOOD AND FEEDING BEHAVIOR

Here again, the amount of information given varies depending on the relative importance of the species in the southeastern marine avifauna and on the amount of information available. In all cases we gave at least a brief general statement on the types of foods eaten and the primary feeding methods. In some instances we included more detailed information on food habits, briefly abstracting recent studies and indicating proportions of different varieties of foods eaten. For a few species for which much recent information is available, we summarized food habits by geographic area. For species whose food habits have been well documented, we pointed out differences in food habits of adults and young, and commented on seasonal variation of food habits as well as difference in foods eaten in different habitats. We gave little specific data on food habits in southeastern waters because little or nothing is known of the diet in this area.

IMPORTANT BIOLOGICAL PARAMETERS

This section presents basic information to allow biologists to infer the effects of developing oil resources on populations and to help choose alternate courses of action in the planning of such developments. We include this information for only thirteen of the species discussed in this report because these species are those most likely to be affected by oil in southeastern waters. Much of the information is derived from studies conducted outside the southeast because only a few species of waterfowl breed in the southeast.

The data in this section consist of brief summaries of the egg-laying period, mean clutch size, incubation period, hatching success, fledging success, age at first breeding and at fledging, mortality of eggs and young (including information on renesting), maximum natural longevity, and weight. Data on egg laying, incubation period, and age at fledging allow one to estimate when birds breeding within the study area are most vulnerable to disturbance. Information on mortality and renesting describes factors that lower reproductive success and suggest the potential for recovery following a nesting failure. Data on clutch size and hatching and fledging success allow an estimate of productivity. Detailed life table data are unavailable for most of the species covered in these reports. Consequently, we have provided figures for known maximum natural longevity that will in some instances allow a crude comparison between species of the total reproductive potential. The maximum natural longevity is given in terms of "estimated minimum age" in years and months following Kennard (1975), and may list information based on banding in the United States and Canada and in the Old World. Finally, we include information on weights, since this and population data given elsewhere in the report will allow planners to compare species in terms of biomass affected as the result of any given oil-related activity.

The quality and quantity of this information vary from species to species and from topic to topic. Many of the waterfowl treated in the second volume of this report are among the best-studied wild birds. For such species we make no attempt to give all the information available, but confine ourselves to brief summaries. For other species, particularly some of the seaducks, information is sparse or nonexistent. We have indicated this in each account.

SUSCEPTIBILITY TO OIL POLLUTION

Instances of oiling for a given species are documented to show the extent to which a species is known to be affected by oil. We stressed records from southeastern waters, but few data are available from this area. We report the number killed in major oiling incidents and the proportion this represented of the total number of all birds killed and identified to species. We may have missed reports of oiling for some species. Much of the Old World literature reports oiled birds only by species groups (e.g., gulls, divers, ducks). Some information may be found in Old World regional periodicals unavailable in the United States and not covered by computer-based literature retrieval systems.

This section refers frequently to an oil-vulnerabity index for birds in the northeastern Pacific developed by King and Sanger (1979). That publication, while valuable, was used with caution since it refers to a different geographic area with a dissimilar environment and a different (but strongly overlapping) species complex. We included some of King and Sanger's index scores in this section, not to indicate the degree of vulnerability in the southeast (although we often think it is similar), but rather to show the degree of vulnerability in another part of the range. The northeastern Pacific area is important to North American populations of a number of species of waterfowl that regularly occur in the southeast (e.g., Redhead, Canvasback, Lesser Scaup) and that are at risk from oil development activities in both areas.

In addition, we estimated the overall potential effect of oil pollution and the development of oil resources on the species in the southeast, taking into account the known or suspected vulnerability of the species, its abundance in the southeast, and its abundance elsewhere.

SPECIES BIBLIOGRAPHY

At the end of each species account is a species bibliography that contains references to the distribution and biology of the species. Selected references to the species treated are also found in the species bibliography which follows the text in each account. The species bibliography also includes many other citations that provide additional data on the topics briefly covered in the text, as well as on various other aspects of the biology of the species. All citations used in the text are included in the bibliography at the end of this report.

The species bibliographies are not exhaustive. In his account of the Canada Goose, Palmer (1976a) indicated he had seen over a thousand papers dealing with this species. To prepare complete or near-complete bibliographies for many of the species included in this volume would entail the publication of a series of books of many thousands of pages. The emphasis in our species bibliographies is placed on the ecology and behavior of the species. More general works and some distributional literature, are found in the terminal section of the Literature Cited. Although some material on taxonomy, parasitology, hybrids, identification, and disease may be included, we did not specifically search for this material. We covered the world literature because little is known of the biology of many of the waterfowl while they are in the coastal southeastern

United States and because most of the waterfowl breed only well north of the area under consideration.

Our search of the literature also stressed recentness of information and each species bibliography should be relatively complete through mid-1980. Some important references published subsequently are included but these may not have been used in writing the account. The variety of recent papers covered is somewhat greater than in Volume I because we attempted to provide a more complete listing of references that have appeared subsequent to recent handbooks. We have listed important papers dealing with the biology of the species going back to the early part of the century, but have been more complete with papers written in English. We include older references that are still major sources of information on the species.

The species bibliographies are arranged from present to past with authors listed alphabetically under each year, rather than in the more conventional alphabetical and chronological arrangement used in the Literature Cited. We did so to make it easier for the reader to find the most recent information on any topic covered by the bibliography.

We have checked all references used in the text as well as a large proportion of the remaining references, but some citations from secondary sources remain unverified. We estimate that the three volumes in this series will contain on the order of 10,000 references in the terminal species bibliographies, and our temporal and fiscal limitations were too great for us to undertake complete verification of all references included.

OIL POLLUTION AND MARINE BIRDS OF THE SOUTHEASTERN UNITED STATES

With the possible exception of marine turtles, marine birds are the vertebrates most severely threatened by oil pollution and the development of oil resources.

The work of Old World biologists presents clear evidence of severe and substantial damage to several populations of marine birds. Specific, detailed information on the effects of oiling and oil spills on wild birds and their populations in the New World, let alone the southeastern United States, is very limited. Whether any given species has ever been oiled and what effect this may have had is unknown in many instances. Systematic gathering of data on the species composition of large seabird kills following oil spills has been done infrequently in the New World and systematic surveys of beached birds have only recently begun in the United States. Furthermore, data on oiling of marine birds are scattered through a diverse body of literature. Many distributional notes reporting the first occurrence or first specimen of a species from a geographic locality parenthetically note that the specimen was oiled. Other information is scattered through regional distributional works, and yet more data, which we did not have time to explore fully, lies in the banding and recovery files of the Bird Banding Laboratory of the U.S. Fish and Wildlife Service.

In Denmark, oil pollution kills thousands of seabirds each year. Most of these are ducks, but many other species are also involved (Riisgard 1979). Oil has caused major losses in populations of Common Eiders in the Danish Waddensea (Joensen 1973), in breeding populations of Common Eiders and Black Scoters in Holland (Swennen and Spaans 1970), and in populations of the Atlantic Puffin (Fratercula arctica) in France (Bourne 1976). Oil is also a major cause of death for Jackass Penguins (Spheniscus demersus) in South Africa (Randall et al. 1980).

Other losses reported include the death of an estimated 25-50% of the Common Loons wintering in Shetland, off Scotland, following the ESSO BERNICLA oil spill on 30 December 1978 (Stowe and Morgan 1979), and the loss of all Mallards, European Coots (Fulica atra), and Moorhens (= Common Gallinule, Gallinula chloropus) following an oiling of the Amer River in the Netherlands; it was estimated that approximately 88% of the Greylag Geese (Anser anser) and about 71% of the Bewick's Swans (Cygnus columbianus bewickii) would ultimately be lost as well (Belterman 1972). Still other examples of major or significant reductions in avian populations due to oil pollution are given in reviews by Bourne (1968b, 1976), Croxall (1975), Vermeer and Vermeer (1975), and Food and Agricultural Organization of the United Nations (1977).

VARIABILITY IN SPECIES' SUSCEPTIBILITY TO OIL POLLUTION

Surveys of beached birds are biased indicators of what proportion of a population is affected by oiling (Bourne 1976). However, the proportions of species found oiled gives some idea of differences in susceptibility between different groups of birds and also suggests the magnitude of the oil pollution problem for a given area. Such surveys also provide data on seasonal variation in the incidence and extent of oil pollution. Table 1 gives the percentage of beached birds that were oiled in four different areas. Species such as loons, grebes, auks, and seaducks are most affected, whereas more aerial species such as gulls and terns are usually among the least affected.

REGIONAL DIFFERENCES IN OILING AND MORTALITY OF BEACHED BIRDS

Although beached bird surveys in the eastern United States have been conducted for only a relatively short time, the extent of oiling in birds found dead along the southern Atlantic coast appears low compared with other areas in the United States and elsewhere. Only 4% of 400 birds found dead along the south Atlantic coast from January 1976 through August 1978 were oiled. In contrast, oiling occurred in 82% of 667 birds found along the Polish Baltic coast from November 1974 to August 1975 (Gorski et al. 1977), in 26% of 162 found along Irish coasts from December 1977 to March 1978 (O'Keeffe 1978), in 79% of 3,431 found on the international beached bird surveys in Northwest Europe in January-March 1975 (Lloyd 1976), and in 18% of 2,420 found along the California coast in 1975 (Ainley 1976).

Bird mortality per mile of beach also tends to be less in the southeastern United States than in other areas (Table 2). Mortality figures for a heavily polluted area, the Polish Baltic coast, (3.2 birds/km or 5.2/mi; Gorski et al. 1977) are considerably higher than for anywhere in the southeast. Other

Table 1. Number and percentage of beached birds examined and oiled (a).

Kinds of Birds	Great Britain		South-Atlantic Coast United States		Oregon-Washington Coast		California Coast	
	Total found	% oiled	Total found	% oiled	Total found	% oiled	Total found	% oiled
Loons (Divers)	152	94	114	4	3	33	175	10
Grebes	54	59	14	64	14	36	798	5
Albatross	--	--	0	--	0	--	8	0
Petrels (b)	337	17	0	--	2	50	0?	-
Northern Fulmar (c)	--	--	0	--	570	28	301	4
Shearwaters	--	--	14	0	0	--	623	22
Storm-petrels	--	--	0	--	4	25	40	0
Gannets	182	50	6	17	--	--	--	--
Cormorants	218	45	6	0	0	--	653	0.5
Brown Pelican	--	--	17	0	--	--	38	0
Wildfowl	1137	76	51	4	26	92	296	7
Phalaropes	--	--	0	--	--	--	119	3
Jaegers	--	--	1	0	0	--	8	0
Kittiwake	--	--	0	--	105	21	33	24
Gulls	2448	30	131	0	16	31	1197	2
Terns	--	--	37	0	0	--	--	--
Skimmer	--	--	1	0	--	--	--	--
Auks	6171	80	0	--	104	94	2848	19

(a) Data for Great Britain, the south Atlantic coast of the United States, the Oregon-Washington coast, and the California coast are from Table 1 *in* Bourne (1976), Malcolm Simons (*in litt.*), Table 2 *in* Harrington-Tweit (1979), and Table 3 *in* Ainley (1976), respectively; the periods covered are 1968-1970, December 1977-August 1978, mid-winter 1976, and 1971-1975, respectively. Data for the southeastern coast through 1 December 1977 are based on surveys from Cape Hatteras, North Carolina, to Cape Canaveral, Florida, thereafter south to Jensen Beach, Florida.

(b) Although Bourne (1976) did not specifically so state, his term 'petrels' probably indicates all Procellariidae (petrels, shearwaters, fulmars, etc.), and may have included Hydrobatidae (storm-petrels) as well. His term 'gulls' probably indicates all Laridae (gulls and terns). For other material summarized here, 'petrels' refers to *Pterodroma*, 'shearwaters' to *Puffinus*, 'gulls' to *Larus*, and 'terns' to Sterninae.

(c) Harrington-Tweit (1979) pointed out that fulmar mortality and at least half that of Black-legged Kittiwakes was not due to oil but that most wildfowl and alcid mortality was attributable to oil.

Table 2. Comparison of regional and seasonal variation of beached bird mortality and incidence of oiling in the eastern United States (a).

	Atlantic Coast N of Cape Hatteras		Atlantic Coast S of Cape Hatteras		Florida Gulf Coast	
Dates	Dead birds/ mile	% oiled	Dead birds/ mile	% oiled	Dead birds/ mile	% oiled
SPRING						
Mar.-May 1979	----	51.4	----	20.0	----	0.0
Mar.-May 1978	----	66.8 (b)	1.58	0.0	----	----
Mar.-May 1977	2.50	5.5	0.95	0.0	0.75	0.0
SUMMER						
Jun.-Aug. 1979	4.40	1.2	0.38	5.6	0.53	0.0
Jun.-Aug. 1978	6.37	0.0	1.00	0.0	1.50	0.0
Jun.-Aug. 1977	6.81	0.9	0.14	0.0	----	----
FALL						
Sep.-Nov. 1979	0.98	13.4	1.43	0.0	0.59	0.0
Sep.-Nov. 1978	1.05	0.0	1.49	0.0	1.00	5.6
Sep.-Nov. 1977	0.24	0.0	0.60	0.0	1.25	0.0
WINTER						
Dec.-Feb. 1978-79	2.19	2.3	1.84	1.1	1.74	0.0
Dec.-Feb. 1977-78	2.70	6.5	2.87	1.4	----	----
Dec.-Feb. 1976-77	9.33	5.5	1.75	0.0	2.88	0.0

(a) This comparison is based on information provided by the Atlantic and Gulf Coast Beach Bird Survey Project. These data, while useful, have sometimes been based on surveys of so few miles of beach that the results obtained may not be adequately comparable from region to region. Dashes indicate that we lack data.

(b) This high figure is the result of an oil spill in the Chesapeake Bay in February 1978.

areas in northwestern Europe vary considerably in recorded mortality during beached bird surveys, but mortalities are usually greater than those found in the southeastern United States. Lloyd (1976) reported a range of 0.17/km (0.3/mi) in part of France to 4.06/km (6.5/mi) in West Germany during the winter of 1975. For Great Britain, 1968-70, the average was 1.3/km (2.1/mi) (Bourne 1976). Reported mortality along the California coast is also greater than in the southeast; surveys there averaged 3.5 birds/mi (2.2/km) from 1971 to 1975 (Ainley 1976). The disparity in beached bird mortality rates between California and Europe and the southeast may result partly from differences in prevailing winds and currents. In parts of North America where prevailing winds blow offshore, most mortality is found around enclosed inlets. On islands offshore in North America and in northwest Europe, where prevailing winds carry dying birds (and oil) to shore, both chronic oil pollution and the recorded mortality of marine birds is greater (Bourne 1976).

MAJOR BIRD KILLS FOLLOWING OIL SPILLS IN THE SOUTHEASTERN UNITED STATES

There are few records of large bird kills following oil spills in southeastern waters, and the records that do exist are usually inadequate. A typical example occurred in late December 1968, when a barge spilled crude oil along the coast of Wakulla County, Florida. This resulted in "many ducks snipe and other birds so covered with oil that they were unable to fly. Smaller birds were unable to walk in the heavy oil" (Center for Short-Lived Phenomena 1969).

We have found only a few instances of major oil spills in or near the study area for which there is even fair information on the number and species of birds killed. The first of these occurred in early February 1976 in the lower Chesapeake Bay. About 250,000 gallons (950,000 l) of No. 6 fuel oil entered the bay following the sinking of a barge near the mouth of the Potomac River (Roland et al. 1977). Subsequent movement of the oil resulted in the widespread contamination of marshes and beaches. Roland et al. (1977) estimated that 20,000 to 50,000 birds were killed. Perry et al. (1979) made individual estimates for each species that died during this spill as well as for five spills that occurred in the Delaware River and for another large spill that occurred in the Chesapeake Bay. They estimated that 15,715 Oldsquaw, 14,571 Horned Grebes, and 12,665 Ruddy Ducks died as a result of these seven spills. A thousand or more each of Canvasbacks, Common Goldeneyes, and scaup were also killed, as well as lesser numbers of 15 other species of ducks, geese, and swans. These figures indicate that about five percent of the North American Ruddy Duck winter population may have been lost to these spills.

The second major mortality following an oil spill in the southeast was in Tampa Bay on the Florida Gulf in mid-February 1970 (Sims 1970). Some 80-100 tons of Bunker C oil were spilled from the Greek tanker DELIAN APPOLON when it ran aground and ruptured its hull (Wallace 1970, Clark 1973). Winds and tides spread the oil to cover more than 100 sq mi (259 sq km) of Tampa Bay. Sims (1970) estimated that as many as 4,500 birds were handled at cleaning and rehabilitation stations following the spill, and Clark (1973) suggested that there may have been as many as 9,000 casualties. Sims (1970) indicated that the St. Petersburg Audubon Society handled "some 500 Common Loon, 200 Horned Grebe, 200 Red-breasted Merganser, 2500 Lesser Scaup and 100 other species including several cormorant, two Mallard, a White-winged Scoter, several heron, a kingfisher and many small shore birds."

SOURCES OF VARIATION IN MORTALITY FROM OIL POLLUTION

A large number of factors are involved in determining the magnitude of detrimental effects of oil pollution on marine birds. Birds oiled in cold weather and cold waters have a much higher fatality than do those in warm weather and warm waters. Even minimal amounts of oil may lead quickly to death under the stress of a cold environmental regime (Levy 1980), but birds in warmer areas may survive the same degree of oiling (R. Clapp, pers. observ.; C. Harrison, pers. comm.). Reports from Europe (Bourne and Bibby 1975, Riisgard 1979) indicate that mortality from oiling is greater during the winter months than during the summer.

Oil spilled in cold water remains liquid longer than in warmer water and is likely to cause more damage as a result. It first forms a "chocolate mousse" water-in-oil emulsion and then becomes tar-balls. Although these forms of oil may present some hazard to birds (Bourne and Bibby 1975), the hazard of fresh oil is apparently much greater.

Bourne (1976) summarized some of the changes in daily, annual, and life cycles of marine birds that may increase their vulnerability to oil pollution. Local currents and winds may bring drifting slicks into rafts of birds roosting on the water. Bourne and Devlin (1969) suggested that most mortality from oiling occurs when roosting or feeding birds are trapped by drifting slicks.

Breeding populations are particularly susceptible to oil. The loss of one member of a pair may mean complete loss of their reproductive potential for that year. Depending on the number of offspring usually produced, this could mean that every breeding bird killed by oil represents a theoretical loss to the population of two birds or more. Although this loss may be recouped in future generations, most marine birds have relatively low productivity and their populations may take many years to recover from one severe oiling incident. Oil in the vicinity of breeding colonies may also diminish reproductive success in other ways, by causing a decrease in the hatching success of contaminated eggs, and by disturbance to the colony resulting from attempts to control pollution (Bourne 1976).

Bourne (1976) also pointed out that marine birds are particularly susceptible to damage from oil when they are molting. When birds lack their usual insulation, smaller than usual amounts of oil may lead to death from chilling, shock, and starvation. Some waterfowl perform a molt-migration in which large numbers gather away from the breeding ground to renew feathers prior to continuing migration. Some molt in late summer, others in the spring just prior to their migration north. Birds in such concentrations are more likely to die in large numbers than those of normal mobility.

Few observations on the behavior of birds encountering oil have been reported. Information available indicates that differences in behavior between species may increase or decrease their vulnerability. According to the International Council for Bird Protection (1960), Long-tailed Ducks (Oldsquaw) will choose to land on oil slicks. If true, this may account for some of the very high oil-related mortalities that have been reported for this diving duck. On the other hand, Guillemots (Common Murres) dive to escape floating oil but suffer the risk of emerging into it and thus becoming severely contaminated (Bourne 1968b). Other species may actively avoid oil; Hainard (1959) reported that some diving ducks (Tufted Duck [Aythya fuligula] and Pochard [A. ferina]) avoid patches of oil floating down a river. Other, more aerial species such as gulls (Bourne 1968b) and Manx Shearwaters (Puffinus puffinus)(Casement 1966) may also actively avoid at least the thicker, more noticeable oil slicks. Some of these birds evidently avoid oil when swimming as well; a Herring Gull (Larus argentatus) and a Black-legged Kittiwake (Rissa tridactyla) that swam into a patch of floating oil immediately took flight (Bourne 1968b, Bourne and Devlin 1969).

The number of birds that die following an oil spill is also related to the type of petroleum that was spilled and how long it has been in the environment. Crude oil is less toxic than refined oils (diesel oil, No. 2 fuel oil, Bunker "C")(Hay 1979), and fresh oil causes more damage than older, more weathered oils (Bourne and Bibby 1975). Some oils may be innocuous enough that oiled birds are not killed and are even capable of cleaning their plumage (Birkhead et al. 1973, Phillips 1974).

The number of deaths from oiling following a spill is not necessarily related to the amount of oil spilled; large spills may result in relatively few deaths, while smaller spills may cause large losses, particularly when substantial numbers of birds are concentrated in small areas (Croxall 1975, Salomonsen 1979). In addition, large catastrophic oil spills may cause no greater loss of marine birds than does chronic oil pollution of the environment (Nelson-Smith 1973, Croxall 1975, Holmes and Cronshaw 1977).

EFFECTS OF OIL ON CONTAMINATED BIRDS AND THEIR EGGS

The primary effect of oil on birds is to cause a loss of buoyancy and insulation when the feathers become matted (Szaro 1977). This increases the metabolic demand to maintain body heat and in cold weather quickly results in chilling. The increased physical effort to remain afloat also increases the demand on the body's resources, and death from exhaustion and exposure may ensue (Bourne 1976). McEwan and Koelink (1973) reported that heat loss of experimentally oiled Mallards and scaup was 1.7 and 2 times greater, respectively, than normal.

Ingestion of oil as the contaminated bird tries to preen its feathers will usually cause further harm. A pioneer study by Hartung and Hunt (1966) showed that ingestion of oil by Mallards and Black Ducks could be followed by nervous disorders, enlargement of the adrenal cortex, lipid pneumonia, diarrhea, and gastrointestinal irritation. A considerable number of experimental studies conducted on marine birds in the United States were reviewed recently at length by Albers (1977), Holmes and Cronshaw (1977), Szaro (1977), Eastin and Hoffman (1978), Ohlendorf et al. (1978), and Stickel and Dieter (1979). Some of the findings that involve both primary and secondary effects of oiling are briefly summarized as follows:

(1) Physiological effects that result from ingestion of oil include dehydration, enteritis, fatty changes in the liver, renal tubular nephrosis, and reduction in the rates of sodium and water transfer across

intestinal mucosa (various authors in Ohlendorf et al. 1978);

(2) A low mortality (under unstressed conditions) was found in adult Mallards fed small amounts of oil; ducklings were more adversely affected (Stickel and Dieter 1979);

(3) Mallard hens laid half as many eggs as usual when fed diets containing 2.5% South Louisiana crude oil (Eastin and Hoffman 1978, Stickel and Dieter 1979);

(4) Ducklings fed 5% South Louisiana crude oil grew more poorly than controls, did not develop normal flight feathers, and exhibited liver hypertrophy and splenic atrophy (Eastin and Hoffman 1978).

Oil, even in miniscule amounts, will severely reduce the hatching success of duck, heron, gull, and tern eggs (Eastin and Hoffman 1978, Stickel and Dieter 1979). As little as 5 microliters of oil reduced hatching of Mallard eggs, by 26% (for Prudhoe Bay crude oil) to 90% (for South Louisiana crude oil; Stickel and Dieter 1979). Toxicity of these and other oils is greater for newer eggs than for those further along in incubation, and older, weathered oils are less toxic than fresh ones. Experimental oiling of the plumage of incubating gulls causes significant egg mortality when the oiled feathers come in contact with the eggs. Oiling of eggs also results in a significant number of deformed chicks: deformed bills, incompletely ossified wing or foot bones, abnormally small liver lobes, and stunting were the most common abnormalities found in these experimental studies (Stickel and Dieter 1979).

POTENTIAL HAZARDS TO MARINE BIRDS FROM OFFSHORE OIL PRODUCTION

About two-thirds of the oil in coastal waters is derived from runoff and effluent from terrestrial sources. Tanker operations account for about 26 times as much oil in marine waters of the United States as do offshore operations (Ohlendorf et al. 1978), but may account for a disproportionately large share of avian mortality to oil. Ohlendorf et al. (1978) suggested that, for the marine environment, it may be safer to produce oil offshore than to import it. It seems likely, however, that onshore habitat change and loss resulting from the development of facilities related to offshore oil production will, in the long run, have a more adverse effect on the waterbirds of the southeastern United States than will oil production itself.

Longley and Jackson (1980) reviewed this problem for brackish marsh areas. They summarized activities related to oil production and their effects on the environment and suggested ameliorative measures that may be taken. Effects include direct loss of vegetation and animals (e.g., by dredging, construction of pipelines and roads); addition of dissolved, particulate, and toxic materials to the environment; and changes in water flows. The authors considered changes in water flow the most damaging hazard, one that may result in complete conversion of a marsh ecosystem. Such an event could be accompanied by a reduction or elimination of the populations of marine birds that use the habitat for nesting or feeding.

Similar effects are likely when offshore barrier islands are affected by development of oil and gas resources. Changes in water flow due to dredging could easily change tidal and current patterns, resulting in the elimination of islands used for nesting. Terrestrial access to larger islands may result in the introduction of predators (e.g., foxes, raccoons) that could eliminate an entire bird colony in the space of a season or two. Disturbance engendered by construction might result in the mass desertion of a traditional breeding area by some species.

Several recent reports reviewed aspects of human activities that are relevant to development of onshore oil facilities. These reports include Mulvihill et al.'s (1980) detailed review of the effects of shoreline structures on the coastal environment, Morton's (1976) review of the ecological effects of dredging, and Buckley and Buckley's (1976, 1977) reviews of the effects of human disturbance on colonially nesting birds.

Burning of natural gas at elevated flares during oil production is another potential hazard because birds migrating at night sometimes fly into such lights. Considerable numbers have been killed at TV towers, lighthouses, and airport ceilometers (Howe et al. 1978), and it might be expected that the elevated flares would attract and incinerate passing birds. Bourne (1979) reported that there have been only about "half-a-dozen second hand" reports of death from this cause during the first 10 years of development in the North Sea, an area where foggy weather conditions should maximize the phenomenon. After commenting on several specific instances of relatively severe loss, including one in which "several hundred storm-petrels" purportedly died, Bourne concluded that "the losses are only an insignificant proportion of the millions of birds passing through the area...".

RECOMMENDATIONS FOR FUTURE RESEARCH

CHOICE OF SPECIES FOR FUTURE RESEARCH

Unlike most of the birds covered in Volumes I and III of this report, the family Anatidae is among the best known groups of birds. Palmer (1976a) pointed out that "At least in the Northern Hemisphere, they are also the most administered, in numerous ways are economically the most important, and continue to be the most studied. The upshot is that, even with present data retrieval methods, nobody, nor any agency, has convenient access to extant information." We agree thoroughly with Palmer's remarks. Our study revealed that there are many sources of information that our resources simply could not tap. The body of unpublished information is staggering in its extent and consists of theses, raw data, informal in-house and preliminary reports, and "gray literature", reports produced by governmental agencies that usually receive a limited distribution and that consequently are often unknown to the academic community.

We examined a goodly amount of such material during the course of this study, but are aware that immense amounts remained unseen. The quality of the material varies drastically; some reports are of exceptionally poor academic quality, but others need little work for submission to an academic journal.

Some that are well done give little new information on a species. However, even in reports of lesser quality there may be bits of information of substantial value. As Palmer (1976a) stated, "One needs to be cognizant of the fugitive stuff because some of it is valuable."

Studies of the Anatidae have characteristically centered about the most hunted species, which are generally regarded as those of greatest economic worth. The Mallard--"the duck", hunted and killed in large numbers, in its domesticated form a major source of food, and widely used as an experimental animal in studies of physiology, toxicology, and other laboratory disciplines--is, with the possible exception of the chicken, probably the best studied species of bird. Other extensively hunted species like the Wood Duck and Canada Goose are also well studied. We think that for these waterfowl, as well as others that are widely hunted, searches for unpublished information on a particular taxon or geographic area may have real value. For other groups and species of marine birds, knowledge of which is based on only a relatively small and manageable literature, funds might be more wisely applied to field research and survey.

Although much is known about many of the species covered in this report, and although research is presently being conducted on many of them, there are a number of species of Anatidae about which we know very little. Bellrose (1976) stated that "In some species of waterfowl our lack of the simplest life history knowledge is scandalous. For example, much of the meager nesting information on the black and surf scoters dates back to the turn of the century." Bellrose (1976) considered that the latter species had the "dubious distinction of being the least studied" of North American ducks. The very short species bibliographies that we were able to assemble for these scoters attest to the continuing relevance of Bellrose's remarks. Indeed, because we gave equal emphasis to each species during the course of compiling the bibliographies, we suspect that the relative length of the bibliographies is it itself a good guide to which species need further research. The ten species with the shortest bibliographies are American Wigeon, Mottled Duck, Cinnamon Teal, Greater Scaup, King Eider, Harlequin Duck, Surf Scoter, Bufflehead, Hooded Merganser, and Masked Duck. However, Erskine (1972) provided a comprehensive review of what is known of the Bufflehead, and reports dealing with diverse species of ducks make the American Wigeon and Hooded Merganser better known than our crude assessment might suggest. Most of the other seven ducks are genuinely poorly known for many aspects of their breeding biology and distribution.

Much work has already been accomplished by the Fish and Wildlife Service in validating aerial surveys of wintering and breeding populations (reviews in Johnsgard 1975 and Bellrose 1976). Some species or species groups are much more visible from the air than others. Perhaps as many as 9 in 10 Green-winged Teal are not seen from the air during surveys of the breeding grounds but perhaps as many as 3 out of 4 scoters are seen. The breeding ground surveys, while valuable, do not cover much of eastern Canada or the northeastern United States. Consequently, the size of the breeding population for species known to breed or believed to breed largely within this area or that have large breeding populations in this area are inadequately known. Species or forms in this report that are in this category include the Atlantic populations of the Snow Goose and Brant, Wood Ducks, Black Ducks, Common Eiders, Harlequin Ducks, Oldsquaw, Surf

Scotors, and Hooded Mergansers. Common Goldeneyes, Buffleheads, Red-breasted and Common Mergansers are species with wide-ranging northern distributions, whose total populations in North America are poorly known because relatively little is known of breeding populations in the eastern United States and Canada.

Surveys of wintering waterfowl in the continental United States miss birds with the result that numbers seen are "considerably below the level of the actual population of a given duck species" (Bellrose 1976). The difficulty in making adequate field identifications of some species has doubtless contributed to our lack of knowledge. The three species of scoters, the two scaup, the Common and Red-breasted mergansers, the two goldeneyes, and the Common and King eiders are not distinguished from one another on the aerial surveys of the wintering and the breeding grounds by the Fish and Wildlife Service. Since the scoters and the other species pairs are also difficult to distinguish on the ground, at least for some age and sex groups, information from bird-watchers is also of limited value. These species are all moderately to highly susceptible to oil pollution.

We suggest that ground surveys be undertaken in various wintering areas along the southeastern coast. Such surveys should provide more information on the proportion of birds missed on aerial surveys. During such ground surveys more attention should be paid to determining the proportion of which species of "scaup", "merganser", "goldeneye" is present in any given area. These proportions, if taken over a wide enough area, and over diverse enough habitats, should allow one to better estimate the size of the populations of diving and seaducks wintering in the southeast.

The economic value of the populations of wintering waterbirds often influences which species of waterfowl are most extensively researched. Johnsgard (1975) estimated recreational values of waterfowl, basing these estimates on an analysis of Christmas Counts from 1954-1962. He concluded that the "five most important waterfowl in terms of recreational value to bird watchers are the mallard, pintail, Canada Goose, American wigeon, and black duck". These species are those found in the greatest numbers and are among those most important to hunters. We disagree, however, that these birds are those most important to bird-watchers, because bird-watchers are usually more interested in those species seen least often. Utilizing Johnsgard's rarity index, the ten waterfowl most important to bird-watchers would be the Masked Duck, Emperor Goose (*Chen canagica*), Steller's Eider (*Polysticta stelleri*), Eurasian Green-winged Teal (*Anas c. crecca*), Black-bellied Whistling-Duck, Trumpeter Swan (*Cygnus buccinator*), Fulvous Whistling-Duck, Ross' Goose, King Eider, and European (Eurasian) Wigeon. West (1979) recently completed a poll of bird-watchers to determine which species they would most like to see. Among ducks, geese, and swans, the ten that instilled the most interest were the Masked Duck, Spectacled Eider (*Somateria spectabilis*), King Eider, Harlequin Duck, Trumpeter Swan, Emperor Goose, Ross' Goose, Steller's Eider, Smew (*Mergus albellus*), and Barnacle Goose. The relatively close correspondence between West's list and Johnsgard's rarity index suggests that Johnsgard's estimate of the recreational values of various species of waterfowl may be distorted. It would appear that some of the rare species of waterfowl in the southeast are both among those least studied (e.g., Masked Duck, King Eider, Harlequin Duck) and those of most interest to bird-watchers.

Large numbers of waterfowl found in the southeast also winter in areas south of the U.S. border. Johnsgard (1975) pointed out that more than half of the total wintering populations of Northern Shovelers and Blue-winged and Cinnamon Teals winter in Mexican waters and indicated that important concentrations of the Brant, White-fronted Goose, Redhead, and Ruddy Duck were also found there. Winter surveys of wintering waterfowl south of the United States are often very incomplete and in some wintering grounds "have been surveyed either not at all or only once in a 25-year period." As stated previously (Clapp et al. 1982), international boundaries are biologically imaginary lines that tend to distort our knowledge of the distribution of birds. This is particularly true for the species covered in Volumes I and III of this report, but also applies to many of the anatids covered in this report. Consequently, we feel that more effort should be expended in determining the status of waterfowl in Mexico and countries to the south so that managers may better evaluate the significance of events that occur while the waterfowl are off our shores. Cooperative international surveys of waterfowl wintering south of the United States could be combined with those documenting the status of other marine birds occurring in the area. Such surveys would supply a much better understanding of the overall status of the species involved and would permit far better insight into the consequences of local managerial decisions on a species throughout its range. Previous efforts along these lines, particularly with respect to Canada and waterfowl, have been highly effective in producing the information needed to manage anatid populations. Similar efforts with regard to other areas might also prove fruitful.

RESEARCH NEEDED ON EFFECTS OF OIL ON SOUTHEASTERN MARINE BIRDS

It is our firm opinion that attempted rehabilitation of oiled birds following a major pollution incident is largely a waste of time, money, and other resources. As Stanton (1977) of the Wildlife Rehabilitation Center put it, "The time has come for the public to realize that cleaning, rehabilitating, and returning oil-covered birds to the wild is often not the wisest investment of their tax dollar." The group working on ecological research on seabirds in Europe is evidently of the same opinion, stating that "since the results of attempts to rehabilitate oiled birds are so poor, it may be more profitable to expend efforts at preventing birds from becoming polluted" (National Environmental Research Council 1977).

On the other hand, we consider it desirable to salvage these birds to find out precisely what birds were oiled and to obtain information that will allow for more prudent responses to future spills. Although there have been many major efforts to "save" oiled birds, these resulted in little information that would aid in planning responses to subsequent incidents. However, there have been exceedingly few instances in which any systematic attempt has been made to determine the full effects of a spill on local populations of marine birds. As Nelson (1977) stated, "documentation of the effects of the spill is a vital postspill responsibility"; consequently, we recommend that every attempt be made to determine what species were affected and how many of each species died.

Obtaining this information is not easy. Even if some notion is obtained regarding which species were oiled by a given spill, counts of dead or contaminated birds (or both) may not indicate how severely a species was affected. One reason for this is that there is seldom adequate information on the number of birds that were present in an area prior to contamination. As a result, even a relatively accurate estimate of the number of birds killed will not reveal how badly local populations were damaged.

Assuming that the number of each species inhabiting an area that becomes oiled was known, it would still be difficult to predict how many birds were or may be affected. For example, the time of passage of an oil slick through an area may be critical in determining the degree of contamination and mortality experienced by each species. During the contamination of the Firth of Forth in February 1978, the oil apparently passed at night near the main feeding area for waterbirds; consequently, there was a proportionately greater loss of night-feeding Greater Scaup and Pochard (Aythya ferina) than there was of Common Goldeneye and Common Eider, most of which had moved elsewhere to roost (Campbell et al. 1978).

The proportion of birds found oiled or dead after a pollution incident may vary widely between species, depending on the habitats used and the habits of the birds. The probability of finding oiled birds that roost or loaf onshore near feeding areas offshore is certainly much greater than it is for those that spend all or most of their time offshore and that, following oiling, might simply sink from sight never to be seen again.

Furthermore, wind and current patterns offshore as well as movements by the birds themselves could take most of the victims of an oil spill far from where they were oiled long before anyone noticed their plight. Levy (1980) analyzed the sort of oil found on dead or moribund birds in the Atlantic off Canada and suggested that Herring and Great Black-backed gulls obtained near Sable Island, Nova Scotia, had been contaminated by oil from the ARGO MERCHANT spill on Nantucket Shoals, some 840 km (522 mi) away. In another instance a badly oiled Pochard (Aythya ferina) flew 7 km (4.3 mi) inland before becoming incapacitated (Campbell et al. 1978).

In some parts of Europe and on the west coast of the United States prevailing winds bring victims of oiling to shore. On the Atlantic seaboard, winds take oiled birds out to sea. It is impossible to make a satisfactory comparison of the extent of damage from oil pollution incidents between these areas. Likewise, estimates of mortality from beached bird surveys in Europe cannot be used to predict the incidence of mortality along the western coast of the Atlantic. At best, they only suggest that damage to wild birds from oil on the U.S. east coast may be underestimated.

Despite all these difficulties in obtaining unbiased data, we recommend that a better effort be made to monitor and publish reports of the effects of oil spills on marine birds. Much of the information needed to answer questions relating to oil pollution and marine birds in the southeastern United States that this report attempts to provide would have been available previously had such efforts been made in the past.

We also recommend that more attention be paid to monitoring the long term and background effects of oil pollution in the southeast. One of the better and less expensive ways in which this may be accomplished would be a periodic censusing of birds found dead along the beaches. This lends some objective basis to speculations about the effects of oil pollution on marine birds, and also provides information about unusual or increasing mortality from other causes (e.g., pesticides). Over a period of time, this may serve as an early warning indicator of where serious problems in wildlife conservation might arise. Such surveys are being conducted presently in the eastern United States by the Atlantic and Gulf Coast Beached Bird Survey Project, but the area covered in some regions (e.g., two miles of the Texas coast [Simons, pers. comm.]) is so small that the information obtained may have little importance.

Many of the biases previously discussed above in regard to oil spills may also be applied to censuses of beached birds. In addition, increasing mortality from another source, such as pesticides, might result in lower mortality from oil and obscure the true effect of the latter. Nonetheless, changes in the number of individuals of a species found dead and in the incidence and degree of oiling from year to year should provide far more needed information than is presently available.

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FULVOUS WHISTLING-DUCK

(Dendrocygna bicolor)

[FR: Dendrocygne a bec fauve, GE: Sichelpfeifgans, SP: Pato silbon, Pichici colorado, Pijia, Serrano; US: Fulvous Tree Duck]

GENERAL DISTRIBUTION

The Fulvous Whistling-Duck is essentially a bird of pantropical distribution, occurring in a series of disjunct populations in Ceylon and India, Central Africa and Madagascar, in northern and southern South America, and from the southwestern United States to central Mexico. The latter population breeds from southern California, southwestern Arizona, central Texas and the Gulf coast of Louisiana south through Mexico to Nayarit, the Valley of Mexico, and Veracruz, and locally in southern Florida, Cuba, and Honduras (AOU 1957, Meyer de Schaunesee 1966, Bellrose 1976). The North American population winters in most of its breeding range, but in recent years increasing numbers have spent the winter in the southeastern United States from Virginia to Florida. Estimates of late summer numbers of Fulvous Whistling-Ducks in southwestern Louisiana and southeastern Texas indicated about 17,000 birds in 1975; some of the recent increase in both breeding and wintering populations in the southeast may be related to changing agricultural methods in that region (Flickinger et al. 1977).

SUSCEPTIBILITY TO OIL POLLUTION

We have found no references to oiling of Fulvous Whistling-Ducks. As birds of vegetated coastal marshes that are seldom found in open water offshore, they are not likely to be affected except by a massive mishap.

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BLACK-BELLIED WHISTLING-DUCK

(Dendrocygna autumnalis)

[FR: Dendrocygne a bec rouge, GE: Herbstpfeifgans, SP: Pato silbador pico rojo, Pichichi comun; US: Black-bellied Tree Duck, Red-billed Whistling-Duck, Black-bellied Wood Duck, Red-billed Tree Duck, Gray-breasted Tree Duck]

GENERAL DISTRIBUTION

The Black-bellied Whistling-Duck is primarily a bird of South and Central America, reaching the northern limit of its distribution in the southern United States. The only regular occurrence in the United States is in lower coastal Texas, where the species is a breeding resident (AOU 1957, Bellrose 1976). Numbers fluctuate markedly from year to year, but the recent trend has been an increase, with an estimate for 1974 of 3,000 breeding birds (Oberholser 1974, Bellrose 1976). Records elsewhere in the southeastern United States include one from Georgia (Teulings 1977b), and several from Florida and Louisiana. Many of the records from these latter two states may have been of escaped captives or introduced birds (Kale 1974, 1978; Lowery 1974).

SUSCEPTIBILITY TO OIL POLLUTION

We have no reports of oiled Black-bellied Whistling-Ducks. These are primarily birds of inland waters, and even in coastal areas do not venture frequently into the open ocean. Because of their habits and because only a small proportion of the total population occurs in the southeastern states, it is unlikely that development in that area would be of serious consequence to Black-bellied Whistling-Ducks.

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MUTE SWAN

(Cygnus olor)

[DA: Knopsvane, DU: Knobbelzwaan, EN: White Swan, Polish Swan; FI: Kyhmyjoutsen, FR: Cygne muet, GE: Hockerschwan, IC: Hnudsvanur, IT: Cigno reale, JA: Kobu hakucho, NW: Knoppsvane, PO: Labedz niemy, PR: Cisne bravo, RU: (Hissing Swan), SP: Cisne mudo, Cisne vulgar; SW: Knolsvan]

GENERAL DISTRIBUTION

The Mute Swan is a native of Eurasia. Feral populations have become established in several areas of North America after escape from captive or semicaptive flocks. It is most common in the northeast from New Hampshire to Chesapeake Bay, but is also well established in Michigan, British Columbia, and western Washington (Bellrose 1976). There are six records of apparently wild birds in North Carolina since 1966 (Potter 1977, Teulings 1977a) but no recent records in South Carolina or Georgia. A seemingly wild bird was seen at Biscayne Bay, Florida, in December 1973 (Stevenson 1974); swans are common in captivity in that state, and escapes are to be expected. There are records of occurrence and occasional nesting in Alabama (Imhof 1976b), but the birds may not have been truly wild.

Some idea of the spread and increase in numbers of North American Mute Swans can be obtained from the annual Audubon Christmas Counts. Between 1949 and 1969 the total number of Mute Swans counted increased from 374 to 1,644 birds (Johnsgard 1975). The 1972 Audubon Christmas Count gave a total of 2,135 Mute Swans along the Atlantic seaboard from New Hampshire to Maryland. On the Pacific coast, 1,449 were counted, and at Traverse Bay, Michigan (the only major concentration in the Midwest), 390 were counted (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

According to Beer and Ogilvie (in Scott 1972), the Mute Swan is the only swan which has experienced severe losses to oil pollution. They noted that these swans were killed or contaminated by oil in at least ten British counties over a decade; in one instance 85 of a flock of 100 died. Oiling of Mute Swans has also been reported in Scotland (Dunnet 1974) and elsewhere in Europe; they have also been reported dying from oil in North America (records in the Bird Banding Laboratory, Patuxent, MD).

Because Mute Swans occur in such small numbers in the southeast, resource development there should pose no hazard to this species.

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WHISTLING SWAN

(Olor columbianus)

[DA: Pibesvane, FR: Cygne siffleur, GE: Pfeifschwan, IT: Cigno minore, PO: Labedz czarnodzioby, SP: Cisne silbador, Cisne chiflador, Ansar careto grande]

GENERAL DISTRIBUTION

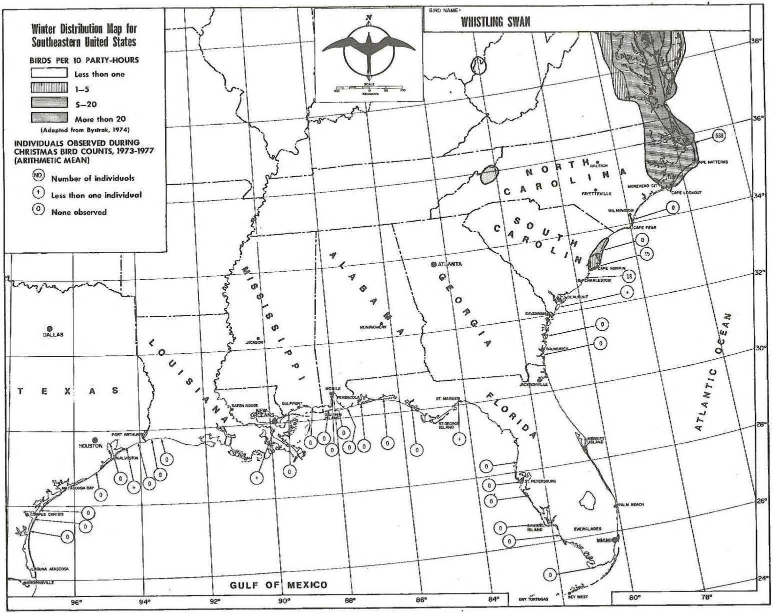
North America Whistling Swans breed coastally in Alaska and eastward across northern Canada east to southwestern Baffin Island, islands in northern Hudson Bay, and the northeast coast of Hudson Bay. In the west they breed south as far as Kodiak Island off Alaska and in the east breed south as far as Belcher Island in southeastern Hudson Bay (Delacour 1954, AOU 1957, Heyland et al. 1970, Palmer 1976a). They winter chiefly along the Pacific coast from British Columbia, Washington, and Oregon, and occasionally in the Aleutian Islands, Alaska, south to California, and they occasionally reach northern Baja California. Along the Atlantic seaboard (Map 1), they winter principally from Maryland (Chesapeake Bay) south to North Carolina (Currituck Sound), and occur rarely north to the Maritimes, Maine, and Long Island, and south to Florida and the Gulf coasts of Texas and Louisiana. In migration they occur on large bodies of water throughout the interior states, including the Great Basin (AOU 1957, Palmer 1976a).

World Distribution Whistling Swans breed entirely within Arctic tundra habitats of North America, although Kistchinski et al. (1975) reported breeding in Siberia. They have been reported from Anadyrland in western U.S.S.R. (Portenko 1939 in Palmer 1976a) and questionably from Scotland (AOU 1957). Winter stragglers have been reported from Mexico, Bermuda, Cuba, and Puerto Rico (AOU 1957, Palmer 1976a), Japan, and possibly England (Evans and Sladen 1980).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

In winter, Whistling Swans are very common on the northern edge of our area, and are uncommon to casual throughout the rest of the southeast (Map 1). Numbers and the wintering range may be increasing.

Taxonomic note: The Whistling Swan is the North American member of a Holarctic, tundra-breeding superspecies of swans which includes the Palearctic Bewick's Swan, Olor bewickii. Palmer (1976a) and Cramp et al. (1977) took the view that these forms are conspecific. They also followed Delacour (1954) and Johnsgard (1975, 1978) in merging the genus Olor into Cygnus. We follow the AOU (1957) in retaining Olor and treating the Whistling Swan as a distinct North American species, although merging the two forms as a single species, the Tundra Swan, will probably be more generally accepted in the future. We have included a number of recent titles regarding the Palearctic swans in the bibliography since the data obtained on these birds may well be relevant to the North American swan.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less thon one
1–5
5–20
More thon 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuols
+ Less thon one individual
0 None observed
BIRD NAME:
WHISTLING SWAN
N
SCALE
Kilometers
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
CAPE HATTERAS
MOREHEAD CITY
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
MOBILE
PENSACOLA
DAUPHIN ISLAND
GULFPORT
BATON ROUGE
NEW ORLEANS
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
688
15
18
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 1

North Carolina Whistling Swans are abundant winter residents of extreme northeastern North Carolina. They may arrive as early as early October, and an occasional bird will linger until May. The principal wintering areas are Lake Mattamuskeet, Hyde County, and Pea Island, Dare County. The population wintering at Lake Mattamuskeet increased from 10,500 in 1970-71 (Teulings 1971a) to over 25,000 in 1976-77 (Teulings 1977a). We do not know how much of this increase represented true population growth and how much was due to displacement of birds that previously wintered in Chesapeake Bay. Bellrose (1976) reported that an average of 14,000 wintered from Back Bay, Virginia, to Lake Mattamuskeet and Pamlico Sound in North Carolina. The winter survey of 1975 (Goldsberry et al. 1980) reported a wintering population of 26,900 in North Carolina; this represents about 22% of the total (ca. 120,900) recorded on the survey of North American waterfowl. Elsewhere in North Carolina, Whistling Swans are regular in small numbers along the coast and rare inland, although inland records are increasing.

South Carolina Sprunt and Chamberlain (1949) called Whistling Swans rare winter residents that occur generally along the coast; they listed dates of occurrence from 22 October to 2 April. Burton (1970) added five records from the 1960's. In 1971-72, several hundred moved south from North Carolina for the winter (Teulings 1972b) and since then these swans have been seen regularly in small but increasing numbers.

Cely (1979) made aerial surveys of wintering populations in South Carolina during 1976-77 and 1977-78 and found about 100 birds each winter. Maximum concentrations found were at Huntington Beach State Park (15 birds), South Island Refuge, Georgetown County (28), Bull's Island (30), and Savannah NWR (25). Cely noted that these swans also concentrate at Doe Hall Plantation, Charleston County. As many as 30 swans have been reported there. He also suggested that the wintering population in South Carolina might be as high as 120 birds if those overlooked during the survey and those from inland localities were included. We list below coastal records since 1970 from American Birds.

1971	2 Jan.	individuals seen	Charleston	Teulings 1971b
1971	9 Jan.	2 seen	Trenton	Teulings 1971b
1971-72	winter	"many more than usual"	Charleston	Teulings 1972b
1971-72	winter	"up to 75 present"	Doe Hall Plantation, McClellanville	Teulings 1972b
1973	6-9 Nov.	1 found	Par Pond, Savannah River Atomic Reserv., near Aiken (inland)	Teulings 1974a
1977	21 Jan.	individual seen	Huntington Beach St. Park	LeGrand 1977a

1977	15-19 Feb.	individuals seen	Santee NWR	LeGrand 1977a
1978	12 Feb.	15 seen	Savannah NWR	LeGrand 1978

Georgia Burleigh (1958) regarded Whistling Swans as rare transients and winter visitors, listing but eight records. Denton et al. (1977) considered them rare winter visitors throughout Georgia and listed dates of occurrence from 13 November to 17 April. Since 1970 they have been regular in small numbers inland and along the coast.

1971	2nd week Jan.	2 seen	Roswell	Teulings 1971b
1974-75	winter	"a few"	Savannah, Dalton, and Macon	Teulings 1975b
1975	30 Nov.	9 seen	Gainesville, Ga. (inland)	Teulings 1976a
1975-76	winter	"some"	Savannah, Sylvania, Thomaston, Atlanta	Teulings 1976b
1979	6 Dec.	1 seen	Okefenokee NWR	LeGrand 1977a
1978-79	winter	7 seen throughout	Augusta (inland)	LeGrand 1979b
1979	Jan.-Feb.	1 seen	Eufaula (inland)	LeGrand 1979b

Florida Whistling Swans are rare on both coasts of Florida (Kale 1979 ms a, 1979 ms b). Of the 14 records of Whistling Swans in Florida listed through 1955 by Sprunt (1954, 1963), most are from the Gulf side of the state, and seven of them from St. Marks NWR. Since 1970 there have been several records involving one or a few birds; these records are mostly from the panhandle and northern peninsula.

1969	1 Dec.	1 seen	Panacea	Stevenson 1970
1969-70	winter	3 seen	Tallahassee	Stevenson 1970
1972	9 Jan.	1 seen	near Lanark	Stevenson 1972
1973	21-23 Dec.	2 seen	near Titusville	Stevenson 1974
1974	late Nov.	2 seen	Mosquito Lagoon	Edscorn 1975

1974	22 Dec.	2 seen	Guana Lake Refuge, St. John's Co.	Stevenson 1975
1976	3 Dec.	1 seen	near St. Mark's Light	Stevenson 1977
1976	9 Dec.	1 seen	St. Joe St. Park	Hamilton 1977
1976	14-25 Dec.	1 seen	McKay Bay	Stevenson 1977
1977	29 Jan.- 28 Feb.	1 seen	Tarpon Springs	Stevenson 1977
1977-78	31 Dec.- 1 Jan.	1 seen	near Lakeland	Stevenson 1978
1977-78	12 Dec.- 26 Feb.	1 seen	near St. Mark's Light	Stevenson 1978

Alabama The Whistling Swan is rare in winter and during migration in the Tennessee Valley region of Alabama (Imhof 1976b). These swans winter almost annually at Wheeler NWR, in Limestone and Morgan counties. At least 47 wintered there in 1978-79 (Hamilton 1979). Whistling Swans are casual elsewhere in the state. Howell (1928) stated that swans, presumably this species, were rare winter visitors in Mississippi Sound. We know of only three coastal records for which more detailed information is available.

1916	early Dec.	1 seen	Mobile	Imhof 1976b, Howell 1928
1964	26 Dec.	1 seen	Mobile CBC	Imhof 1976b, Dorn 1965
1976	14-17 Dec.	5 ad., 2 imm. seen	Foley, Baldwin Co.	Hamilton 1977

Dates of occurrence within Alabama range from 25 October to 25 March (Imhof 1976b).

Mississippi Whistling Swans occur in Mississippi as rare and irregular winter visitors. Burleigh (1944) mentioned no records from the coast and only one of several recent sightings was coastal; according to Hamilton (1979), this was the first record from the coast of Mississippi.

1974-75	12 Dec.- 13 Jan., 26 Jan.- 9 Mar.	5, 3 seen	5 mi W Tunica	Hamilton 1975
1976-77	16 Dec.- 22 Jan.	1 imm. seen	Noxubee NWR	Hamilton 1977

1976-77	24 Mar.-3 Apr.	2 seen	Noxubee NWR	Weber and Jackson 1977
1977	24 Nov.	1 ad. seen	Noxubee NWR	Weber and Jackson 1978
1978	3 Jan.	1 seen	Lake Washington	Jackson and Cooley 1978a
1978	25 Nov.	2 seen	Pearl River Waterfowl Refuge	Jackson and Cooley 1978a
1978	30 Dec.	4 seen	S. Hancock Co. CBC	Hamilton 1979

Louisiana Lowery (1974) noted less than two dozen "positive" identifications of Whistling Swans in Louisiana, and commented that these swans are rarer than in the past. There was an influx in the winter of 1976-77; nine individuals were reported at five localities (Hamilton 1977). Records extend from 15 November through mid-February (Lowery 1974).

Texas Oberholser (1974) listed Whistling Swans as locally scarce to rare in Texas, occurring between September and April; extremes are August and 3 May, and there is a summer record for Dallas County. Prior to 1900, swans apparently were common throughout the state. They are now locally scarce to rare both inland and along the coast (Oberholser 1974). Recent records are as follows:

1969	18 Dec.	4 seen in flight	Port Isabel	Webster 1970
1969	Dec.	"a few" seen	Galveston Bay area	Webster 1970
1970	Jan.-Feb.	up to 12	Corpus Christi-Rockville area	Webster 1970
1970	28 Dec.	1 seen	between Brownsville and Port Isabel	Webster 1971
1971-72	winter	4 seen	Sheldon Reservoir, near Houston	Webster 1972
1975	14-28 Mar.	4 seen	Holiday Beach, Rockport	Webster 1975a
1977	Nov.-Dec.	6 seen	Chambers Co.	Webster 1978b
1977	early Dec.	1 imm. seen	Rancho Santa Margarita, Starr Co. (inland)	Webster 1978b

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding Whistling Swans breed in Arctic North America, from western Alaska to Baffin Island. The breeding population consisted of about 90,000 adults

(60,000 in Alaska) in the early 1970's (Bellrose 1976).

Winter The U.S. wintering population was believed to be about 123,000 birds (the 90,000 breeding birds, plus juveniles and subadults) during the early 1970's. About 55,000 of these wintered in the east, of which 40,000 were in Chesapeake Bay (Bellrose 1976). The 1975 winter waterfowl survey (Goldsberry et al. 1980) reported about 120,900 Whistling Swans. About 45% of these were in the Pacific Flyway, and almost all the rest were found in the Atlantic Flyway. The great preponderance of those wintering in the southeastern states were found in North Carolina, which harbored about one third of the population wintering along the Atlantic seaboard. Only California (ca. 46,000) and Maryland (36,400) had larger wintering populations.

Migration The Athabasca Delta is a major fall staging area for swans from western and northern Alaska and from much of the Canadian breeding range. From there, many birds move southwest through Montana and Utah to wintering areas in the west. Most of the birds wintering on the Atlantic coast also gather in the Athabasca Delta but fly east-southeast through Manitoba, North Dakota, and the Great Lakes States to the Chesapeake Bay area (Bellrose 1976).

In Chesapeake Bay, fall migrants continue to arrive during December and reach peak numbers in January (Bellrose 1976). The spring departure for Whistling Swans wintering in the east begins in early or mid-March, and migration continues through April (Bellrose 1976, Palmer 1976a). A few may depart as early as late February or as late as early May (Palmer 1976b).

HABITAT

Nesting Throughout its breeding range in North America the Whistling Swan is associated with Arctic tundra. Nest sites are typically widely dispersed over the tundra, and small islands in tundra pools are preferred nesting sites. Other nests are found elsewhere in the tundra, sometimes well removed from water (Palmer 1976a, Bellrose 1976). Lensink (in Bellrose 1976) estimated that about half the swan nests in coastal areas of the Yukon Delta were on the shores of lakes or ponds within 60 ft (18 m) of water. Some 30% of the remainder were on small islands or points in lakes; the rest were in a variety of situations, such as heath tundra, marshes, or tidal meadows. In the latter, the swans frequently nested on elevated hummocks, and nests were less common in level areas. Whistling Swans are usually absent from the bare areas of the Pre-Cambrian Shield in central and eastern Canada (Johnsgard 1975).

Feeding Detailed studies of feeding habitat, at least in the east, have not been made. Swans wintering in Chesapeake Bay prefer brackish estuarine bays, but they have been found feeding in California in both dry and flooded fields (Bellrose 1976). During the early 1970's, swans wintering in the Chesapeake Bay area fed less in aquatic habitats and began to feed regularly in fields of waste corn (Zea), soybeans (Glycine), and shoots of winter wheat (Triticum) on the Maryland Eastern Shore; they commonly flew as much as 10-15 mi (16-24 km) inland to feed there (Bellrose 1976).

Winter Wintering birds prefer large, shallow expanses of fresh and brackish water and occur infrequently in salt water (Palmer 1976a). In Chesapeake Bay, these swans preferred open, extensive areas of brackish estuarine water no more than 5 ft (1.5 m) deep (Stewart and Manning 1958, Stewart 1962). During January, Whistling Swans used brackish estuarine bays 76% of the time, salt estuarine bays 9%, fresh estuarine bays 8%, and slightly brackish estuarine bays 6%. Other habitats (ca. 1%) used included coastal impoundments and fresh and estuarine marshes. Fresh-water areas were used primarily by early fall arrivals (Stewart 1962).

FOOD AND FEEDING BEHAVIOR

These swans normally dip their heads and necks into the water to feed on bottom vegetation; when feeding in deeper waters they may tip up to seize submerged foods (Bellrose 1976). In terrestrial situations Whistling Swans may both grub and graze (Palmer 1976a) and may browse on shore grasses (Gilmer 1974).

Food habits on the breeding grounds are largely unknown, but in migration and on the wintering grounds Whistling Swans usually feed extensively on aquatic plants (Johnsgard 1975, 1978). Stewart and Manning (1958) analyzed 49 stomachs of birds wintering on Chesapeake Bay. They found that 100% of the diet in fresh estuarine waters consisted of submerged aquatic plants. In brackish waters and estuarine marsh ponds these plants formed 60% and 49% of the diet, respectively. In the Chesapeake Bay region wild celery (Valisneria spiralis) was an "all-important" item of diet in fresh estuarine areas but widgeongrass (Ruppia maritima), sago pondweed (Potamogeton pectinatus), and two bivalve molluscs (long clam [Mya arenaria] and Baltic macoma [Macoma balthica]) were the most important foods when all feeding habitats were considered (Stewart and Manning 1958). Other plants eaten in the east include foxtail grass (Alopecurus), pondweeds (Potamogeton spp.), squarestem spikerush (Eleocharis quadrangulata), arrowhead (Sagittaria) and coontail (Ceratophyllum demersum)(Palmer 1976a).

We have found little information on the diet of birds wintering in the southeastern states. Presumably they feed on much the same foods as in Chesapeake Bay. Cely (1979) suggested that the principal foods in South Carolina were widgeongrass and muskgrass (Chara sp.). In the winter of 1969-70, swans foraged in fields on the wintering grounds near Chesapeake Bay to a much greater extent than formerly; we do not know whether this trend continued nor how important waste grain may be in the diet of Whistling Swans wintering in the southeast. Johnsgard (1975), Bellrose (1976), and Palmer (1976a) summarized what little is known of food habits elsewhere in North America.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Time of laying at any particular locality may vary considerably from year to year (Palmer 1976a) but is usually remarkably synchronous within any given season (Bellrose 1976). Egg laying usually begins in late May or early June (Johnsgard 1975, Palmer 1976a) and in some areas nests with eggs have been found as late as mid-July (Palmer 1976a).

Mean Clutch Size Clutch size varies with the timing of the season; it is lower in late seasons. In a study of 354 nests from 1963-71 on the Yukon Delta, Alaska, Lensink (1973 in Bellrose 1976) found an average clutch size of 4.26 eggs. Average clutch size varied from 3.3 in a late season to about 5 in an early season.

Incubation Period The most accurate figure for the incubation period of the Whistling Swan in the wild is based on a single instance in which the last egg of a clutch hatched after a 31-day interval. In another instance, incubation took about 32 days (Lensink in Bellrose 1976).

Hatching Success We found no precise figures for hatching success expressed as the proportion of eggs laid that hatched. Lensink (in Bellrose 1976) thought that nesting success--considered as the proportion of nests in which at least one egg hatches--was very high on the Yukon Delta; he believed that at least some eggs hatched in over 90% of the nests. Bellrose (1976) suggested that perhaps one egg of the average clutch fails to hatch, basing his remarks on average clutch size and the size of broods seen in June and July.

Fledging Success No definite data are available. Bellrose (1976) presented data indicating that production of young is low. On the other hand, adults accompanied by young tend to have two or more (Bellrose 1976), suggesting a high success for some clutches and the complete loss of others.

Age at Fledging Bellrose (1976) suggested that most cygnets probably fly at 60 to 70 days, but noted that some might need 75 days.

Age at First Breeding Lensink (in Bellrose 1976) suggested that few birds breed before their third summer, and that most probably first breed when older.

Mortality of Eggs and Young Palmer (1976a) considered egg-gathering by Eskimos and Indians a significant mortality factor in some areas. Lensink (in Bellrose 1976) noted nest destruction by gulls and foxes.

Early freezing of water in fall accounted for some 3-5% of pre-fledging mortality in young from the Mackenzie-Anderson River Delta area. In other areas, freezing was reported as an occasional source of major mortality (Bellrose 1976, Palmer 1976a).

Renesting Swans occasionally lay repeat clutches if nests are lost early in the nesting cycle, but the chances of northern swans doing this successfully in the wild are considered poor because of the short nesting season (Kear in Scott 1972).

Maximum Natural Longevity A bird banded on the Anderson River Delta, Northwest Territories, attained an age of 16 years and 2 months (Clapp et al. in press).

Weight Mean weight of 42 adult males was about 16 lb (7,260 g) and 63 adult females averaged 13.9 lb (6,300 g). The mean weight of adults wintering in Utah was 17.3 lb (7,850 g) and that of immatures was 13.3 lb (6,030 g) (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

Wintering Whistling Swans normally rest on the water at night in protected inlets, estuaries, and lakes. They are very vulnerable to oiling in these waters, and probably are more likely to be affected by spills at onshore support facilities than by offshore drilling accidents. Perry et al. (1979) estimated that 385 Whistling Swans died as a result of two oil spills in Chesapeake Bay in 1976 and 1978.

King and Sanger's (1979) study of the vulnerability of marine birds in the northeastern Pacific suggested that there should be high concern for Whistling Swans regarding potential ill effects from development of petroleum resources. Among anatids only the sea-ducks, Black Brant, and Emperor Goose were considered more vulnerable. Concern for the effects of oil on this species should also be high for populations wintering in North Carolina; so few birds winter elsewhere in the southeast that oil pollution elsewhere should have little effect on the total population.

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WHITE-FRONTED GOOSE

(Anser albifrons)

[DA: Blisgas, DU: Kolgans, EN/US: Specklebelly, White-front, Tule Goose, Speck, Laughing Goose, Specklebelly Brant; FI: Isokiljuhanhi, FR: Oie rieuse, GE: Blassgans, IC: Blesgaes, IT: Oca lombardella, JA: Ma-gan, NW: Tundragas, PO: Ges bialoczelna, PR: Ganso, RU: (White Goose), SP: Ganso frente blanca, Oca salvaje, Ansar careto grande; SW: Blasgas]

GENERAL DISTRIBUTION

White-fronted Geese breed circumpolarly on tundra around the shores of the Arctic Ocean, the Bering Sea, and Baffin Bay. They nest from Kanin in the eastern U.S.S.R. to the northwest coast of Hudson Bay and have an isolated breeding population in southwestern Greenland (Bellrose 1976, Palmer 1976a, Cramp et al. 1977). About two-thirds of the North American breeding population of approximately 100,000 birds (Bellrose 1976) is found in Alaska; most of the rest inhabit north-central and northwestern Canada (Palmer 1976a). These geese occur in the southeastern states primarily as migrants and winter residents and reach their peak abundance there along the coasts of southwestern Lousiana and Texas (Map 2) where as many as 66,000 may winter (Bellrose 1976). These geese are rare to casual along the Atlantic seaboard and are scarcely more common along the shores of the eastern Gulf.

SUSCEPTIBILITY TO OIL POLLUTION

There is little information on direct effects of oil pollution on White-fronted Geese. Most of some 2,000-2,500 geese soiled with fuel oil in the Hollands Diep, Netherlands, in the winter of 1970-71 were White-fronted Geese, but the number that died is unknown (Ouweneel 1971). Judging both from reports on the direct effects of oil on other closely related species and from the White-fronted Goose's preference for habitats inland (Palmer 1976a), we suspect that this species is not especially vulnerable to oiling. Areas of mud-flats and adjacent marsh areas that are used extensively for roosting and foraging and which are likely to be oiled are areas in which these geese will be most susceptible. In such areas the result of oiling probably will be primarily indirect mortality through loss of food resources rather than direct mortality.

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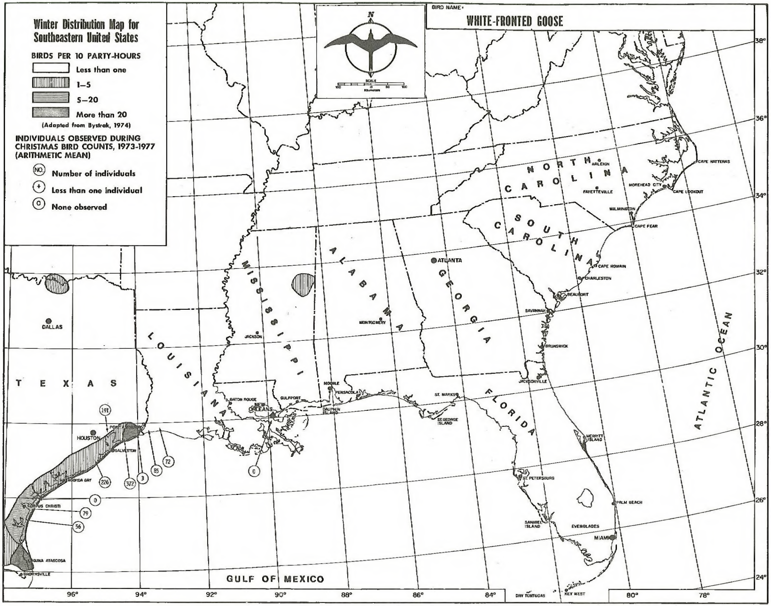
Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
(NO.) Number of individuals
(+) Less than one individual
(0) None observed
BIRD NAME:
WHITE-FRONTED GOOSE
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
GALVESTON
PORT ARTHUR
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
JACKSON
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
FAYETTEVILLE
RALEIGH
MOREHEAD CITY
CAPE LOOKOUT
CAPE HATTERAS
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
197
226
372
3
85
72
0
0
79
56
96°
94°
92°
90°
88°
86°
84°
80°
78°
24°
26°
28°
30°
32°
34°
36°
38°

Map 2

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SNOW GOOSE

(*Chen caerulescens*)

[DA: Snegas, DU: Sneeuwgans, FI: Lumihanhi, FR: Oie des neiges, GE: Schneegans, IC: Snjogaes, IT: Oca iperborea, JA: Haku gan, NW: Snogas, PO: Ges sniezyca, RU: (White Goose), SP: Ansar hiperboreo, Ansar nival, Ansar real, Ansar azul; SW: Snogas, US: Blue Goose, Greater Snow Goose]

GENERAL DISTRIBUTION

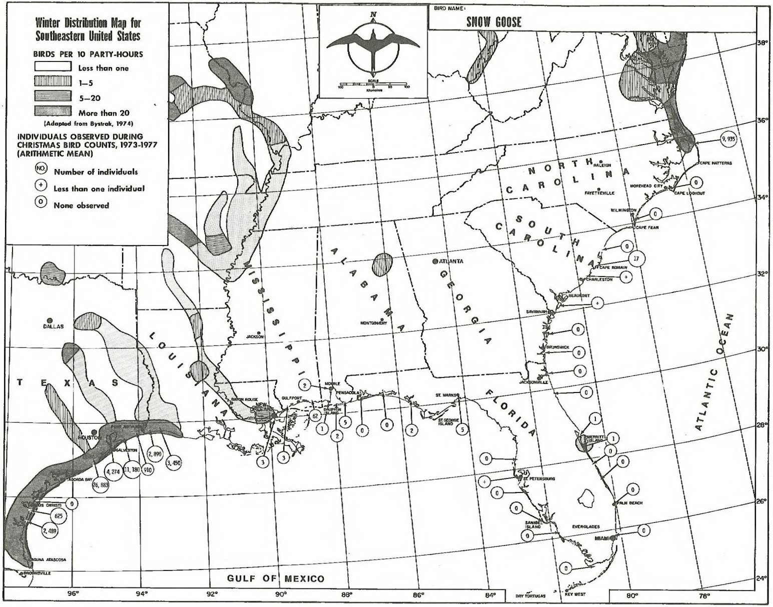
Snow Geese breed in Arctic tundra from northeastern Siberia eastward across the North American Arctic to northwestern Greenland (Cramp et al. 1977). About 1,635,000 Lesser Snow Geese breed in the western and central North American Arctic. Large numbers winter in Louisiana (ca. 380,000 during the winters of 1972-73) and Texas (ca. 435,000)(Bellrose 1976; Maps 3, 4). In Alabama and Mississippi the Snow Goose may be abundant during migration (Burleigh 1944, Imhof 1976b) but the species is uncommon to rare elsewhere in the southeast.

About 67,000 Greater Snow Geese nested in Greenland and the eastern Canadian Arctic in 1969 (Heyland *in* Palmer 1976a). These birds winter primarily along the Atlantic coast from New Jersey to North Carolina. The largest wintering concentration (ca. 30,000 birds) is found in Currituck and Pamlico sounds, North Carolina (Bellrose 1976).

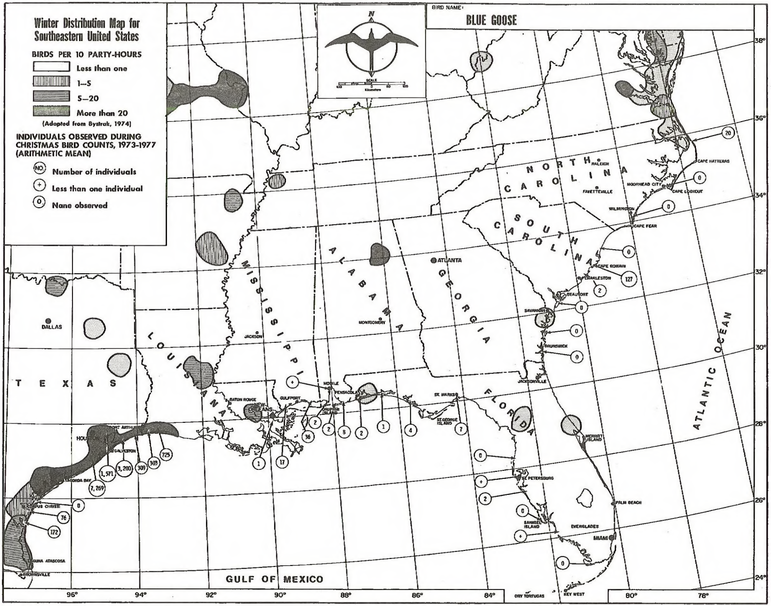
SUSCEPTIBILITY TO OIL POLLUTION

We believe that direct mortality of Snow Geese from oil spills will be slight, since few of their activities would bring them into contact with areas of spilled oil. The species would be most susceptibile on the north Atlantic coast, because of cold weather and a tendency to utilize marine habitats more than the birds that winter in Louisiana and Texas (Palmer 1976a). The most deleterious effects in warmer areas would probably occur on marshy feeding grounds if an oil spill were severe enough to inundate these areas. Such an episode occurred when an oil spill in the Gulf of St. Lawrence penetrated into marshes used as a major staging area by the Greater Snow Goose. The disaster was averted by prompt cleanup of the area before the geese arrived (Eagles 1964).

Taxonomic note: The AOU (1957) check-list assigned the Snow Goose to the genus *Chen*. Opinions differ regarding the status of *Chen*, and it is often lumped with genus *Anser*, following Delacour (1954) and Johnsgard (1975, 1978). Similarly, the AOU (1957) formerly listed the Snow and the Blue Goose as separate species. Evidence presented by Cooch (1961) and Cooke and Cooch (1968), however, confirmed that the Blue and Snow Geese are color phases of the same race. Currently, the AOU (1973) recognizes two subspecies: the Lesser Snow Goose, *Chen caerulescens caerulescens*, and the Greater Snow Goose, *C. c. atlantica*, the former displaying two plumage phases: dark (or blue form), and light phase.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
SNOW GOOSE
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°
NORTH CAROLINA
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
9, 935
0
0
SOUTH CAROLINA
CAPE ROMAIN
CHARLESTON
BEAUFORT
0
17
+
+
GEORGIA
ATLANTA
SAVANNAH
BRUNSWICK
JACKSONVILLE
0
0
0
0
ALABAMA
MONTGOMERY
MOBILE
DAUPHIN ISLAND
MISSISSIPPI
JACKSON
GULFPORT
LOUISIANA
BATON ROUGE
NEW ORLEANS
TEXAS
DALLAS
HOUSTON
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
3, 450
2, 890
910
11, 180
4, 274
26, 883
0
625
2, 489
3
3
62
2
1
2
5
0
0
2
5
PENSACOLA
ST. MARKS
ST. GEORGE ISLAND
FLORIDA
MERRITT ISLAND
1
1
0
0
0
PALM BEACH
MIAMI
0
EVERGLADES
0
+
0
0
ST. PETERSBURG
SANIBEL ISLAND
0
0
KEY WEST
DRY TORTUGAS
GULF OF MEXICO
ATLANTIC OCEAN

Map 3


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1—5
5—20
More than 20
(Adopted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
BIRD NAME:
BLUE GOOSE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOORHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
MERRITT ISLAND
PALM BEACH
EVERGLADES
MIAMI
KEY WEST
DRY TORTUGAS
SANIBEL ISLAND
ST. PETERSBURG
ST. MARKS
ST. GEORGE ISLAND
ATLANTA
MONTGOMERY
JACKSON
MOBILE
PENSACOLA
DAUPHIN ISLAND
GULFPORT
BATON ROUGE
NEW ORLEANS
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
20
0
0
0
127
2
0
0
0
0
+
2
0
+
0
7
4
1
2
8
2
2
36
17
1
+
725
303
309
3,200
1,571
7,269
0
76
172
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 4

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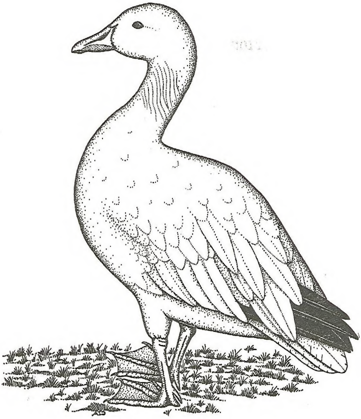

ROSS' GOOSE

(Chen rossii)

[FR: Oie de Ross, GE: Zwergschneegans, SP: Ansar de Ross, Ganso de Ross]

GENERAL DISTRIBUTION

Ross' Geese breed in North America primarily in the Perry River region south of Queen Maud Gulf in the Northwest Territories (Palmer 1976a, Johnsgard 1978). They have also been found breeding on the Boas River, Southampton Island and near the mouth of the McConnell River, N.W.T. (Bellrose 1976). Bellrose (1976) reported that the average February population for the period 1956-74 was 23,400.

These geese winter chiefly in central California (Johnsgard 1978), with small but inceasing numbers wintering along the central Gulf in recent years. Prevett and MacInnes (1972) estimated that the wintering population in Louisiana was 127, 178, and 167 in 1968, 1969, and 1970, respectively, and they believed that several hundred more wintered along the Texas Gulf coast. Elsewhere in the southeast, Ross' Goose is a very rare to accidental visitor and has been reported only in North Carolina. We know of five records from that state (Buckley 1969; Teulings 1971b, 1971c, 1972b, 1976b; E. K. LeGrand 1972) but these may not involve more than three individuals.

SUSCEPTIBILITY TO OIL POLLUTION

We have found no records of specific instances of oiling of Ross' Goose, which is one of the least coastal geese in winter. It is probably one of the least vulnerable species in the southeastern area, because of its terrestrial habits and because of the small (but increasing) numbers that winter there.

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CANADA GOOSE

(Branta canadensis)

[DA: Kanadagas, DU: Canadese Gans, FI: Kanadan hanhi, FR: Bernache du Canada, GE: Kanadagans, IT: Oca del Canada, JA: Shijukara gan, NW: Canadgas, PO: Bernikla kanadyjska, SP: Barnacla canadiense, SW: Kanadagas]

GENERAL DISTRIBUTION

The Canada Goose is a widespread and abundant breeding bird across Canada and the northern United States. Its historical breeding range has been altered by the virtual extinction of some populations, notably in the north-central states, and the establishment or re-establishment of other populations. The total population has increased greatly in recent decades, and Bellrose (1976) estimated about 3 million birds at the beginning of the 1974 hunting season. In winter the Canada Goose is found almost throughout the United States in suitable habitat. Management practices in recent years, particularly winter feeding and the development of artificial impoundments, have resulted in more birds wintering in northerly areas and fewer birds in the southern part of the range. Well-defined migration corridors are used by various subpopulations, but the species may occur almost anywhere in North America during migration.

This goose is common in winter in the coastal southeastern United States, with some birds remaining to breed in the summer months. About 68,000 wintered in coastal North Carolina in the 1970-75 period (Bellrose 1976). Another 10,500 wintered on the South Carolina coast, 23,000 wintered in Alabama, and 40,000 wintered in coastal Texas marshes (Bellrose 1976). Smaller numbers were present in other southeastern states (Map 5). Numbers in the south were generally smaller than in past decades.

SUSCEPTIBILITY TO OIL POLLUTION

The Canada Goose is susceptible to oil pollution. An estimated 300 died following two oil spills in the Chesapeake Bay in 1976 and 1978 (Perry et al. 1979). The Bird Banding Laboratory has received slightly over 20 bands returned from birds found oiled, including one from Texas. However, the bird's decreasing abundance in the southeastern states, in addition to its inland, fresh water or coastal marsh habitat suggest that oil contamination in this area would have little effect on the overall population.

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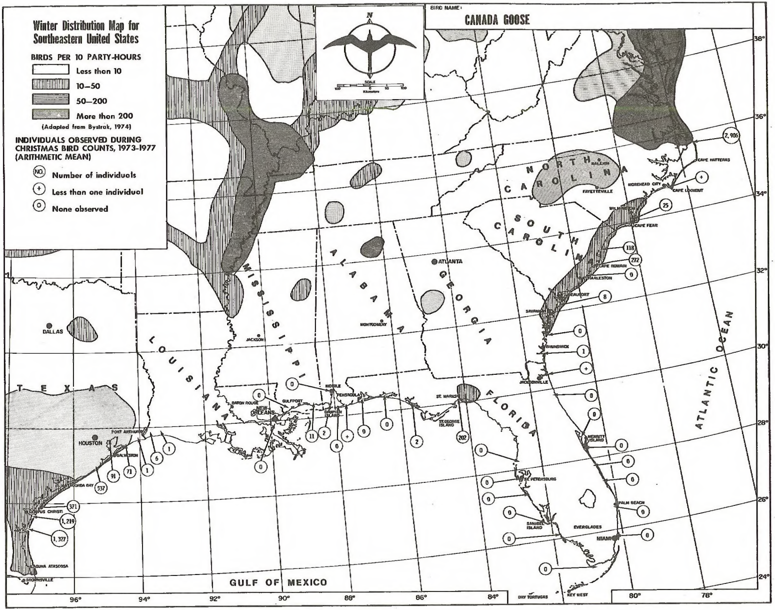
Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO.
Number of individuals
+
Less than one individual
0
None observed
N
SCALE
BIRD NAME:
CANADA GOOSE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
MOBILE
PENSACOLA
GULFPORT
DAUPHIN ISLAND
BATON ROUGE
NEW ORLEANS
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
2,906
+
25
118
272
0
8
0
1
+
0
0
0
0
0
0
0
0
0
202
2
0
0
+
0
2
11
0
0
0
1
6
1
71
91
537
371
1,219
1,327
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 5

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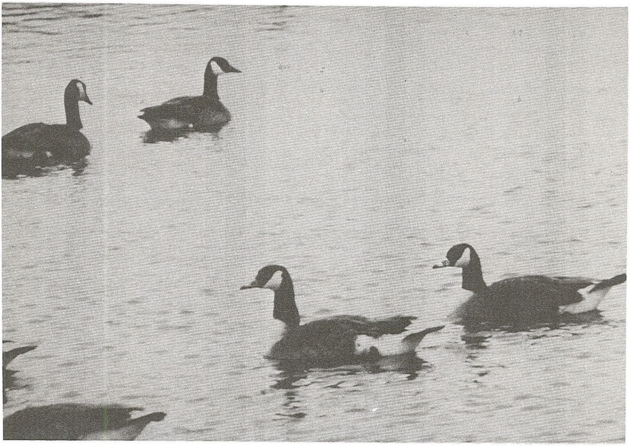

Canada Geese. Photograph by Tom Dwyer, U.S. Fish and Wildlife Service.

BARNACLE GOOSE

(Branta leucopsis)

[DA: Bramgas, DU: Brandgans, FI: Valkoposkihanhi, FR: Bernache nonnette, GE: Weisswangengans, IC: Helsingi, IT: Oca facciabianca, NW: Kvitkinngas, PO: Bernikla bialolica, RU: (White-cheeked Goose), SP: Barnacla cariblanca, Ganso de collar; SW: Vitkindad gas]

GENERAL DISTRIBUTION

The Barnacle Goose is an Old World species, breeding in Greenland and on Spitsbergen and Novaya Zemyla in the Baerents Sea. It winters in northern Europe (Salomonsen 1950, Cramp et al. 1977, Johnsgard 1978). The species is of only casual occurrence in North America (AOU 1957), and some of the records here may be of birds escaped from captivity. There are seven records for North Carolina, ranging from 1870 (Wray and Davis 1959) to 1972 (Grant 1972). There were two observations, of three birds, in Alabama in 1969 and 1970 (Imhof 1976b), and there are three reports from Texas, 1968-71 (Webster 1971a, Oberholser 1974).

SUSCEPTIBILITY TO OIL POLLUTION

Barnacle Geese have been recorded as affected by oil in at least one instance. About 200 oil-smeared Barnacle Geese (out of over 9,000) were found after the release of fuel oil into the Amer River in the Netherlands in December 1970 (Ouweneel 1971). The proportion of oiled Barnacle Geese was considerably less than in other species of geese present. Due to the rarity of this bird in the southeastern United States, the effect of oil pollution in this area should be of little concern.

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BRANT

(Branta bernicla)

[DA: Knortegas, DU: Rotgans, EN: Brent Goose, Brent, Sea Goose, White-bellied Brant; FI: Sepelhanhi, FR: Bernache cravant, GE: Ringelgans, IC: Margaes, IT: Oca Colombaccio, JA: Koku gan, NW: Ringgas, PO: Bernikla obrozna, PR: Ganso-bravo, SP: Barnacla carinagra, Brantal; SW: Prutgas, US: Black Brant, American Brant, Atlantic Brant]

GENERAL DISTRIBUTION

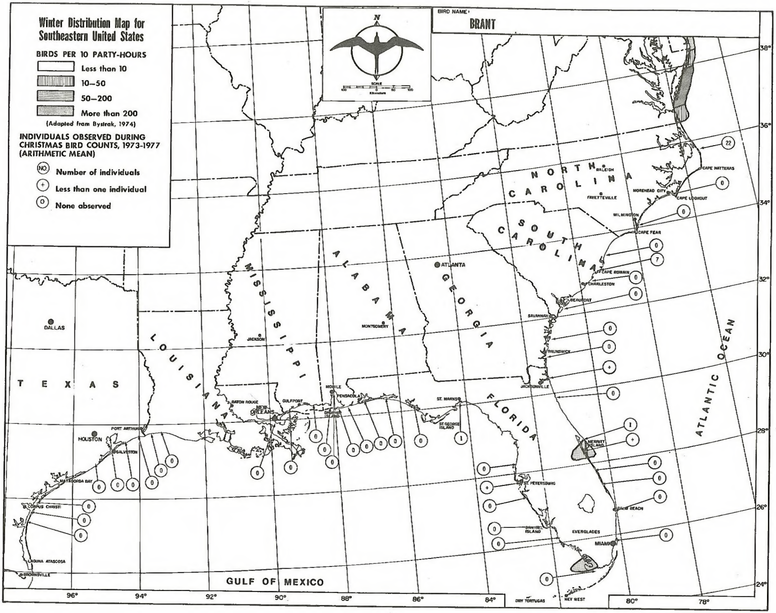
North America Brant breed in the maritime Arctic regions of eastern North America west to about longitude 100° W, including the Parry Islands, Axel Heilberg Island, northern Ellesmere Island, Southampton Island, the islands around the Gulf of Boothia, Prince Regent Inlet, Wellington Channel, and Baffin Island (AOU 1957). They winter chiefly along the Atlantic coast of the United States from Massachusetts south to North Carolina, rarely farther south, and less commonly off western North America from southwestern British Columbia south to the coasts of Baja California and the mainland of western Mexico (Bellrose 1976). There are inland records from many of the eastern and mid-western states (AOU 1957). The western subspecies (Black Brant) breeds in eastern Asia, northern Alaska, and northwestern Canada east to about 110° W; eastern and western forms intergrade on the edges of their breeding ranges. Western birds winter on the Pacific coast of North America from British Columbia south to Baja California and the coast of mainland Mexico (Bellrose 1976), and on large inland western lakes. There are records from Hawaii, inland western states, and Atlantic coastal states (AOU 1957, Einarson 1965).

World Distribution Brant breed in a circumpolar Arctic belt across North America and across Eurasia from northern Greenland (Salomonsen 1950), Spitsbergen, and Franz Josef Land to eastern Siberia. They winter south to Japan and northern China and along the coasts of northwestern Europe and northern Russia (AOU 1957). These geese may stray in winter as far south as northern Africa (Delacour 1954, Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

Brant are common in winter in North Carolina and casual or rare elsewhere in the southeast (Map 6). Like most other geese, Brant are regularly kept in captivity and occurrences away from their normal marine habitat may not be natural.

Taxonomic note: The AOU (1957) believed American populations represented distinct species, the Brant (B. bernicla) in the east and the Black Brant (B. nigricans) in the west. More recently, the AOU (1976) has merged the forms into a single species, a treatment earlier adopted by many authorities (Johnsgard 1975, Bellrose 1976, Palmer 1976a).


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
BRANT
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
CAPE HATTERAS
MOREHEAD CITY
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
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Map 6

North Carolina Pearson et al. (1942) listed Brant as common wintering birds. They are present from November to March or April and are rare south of Pamlico Sound (Potter et al. 1980). These Brant are usually restricted to saltwater areas like Pamlico Sound that have extensive areas of submerged sandbars and mudflats and abundant supplies of eelgrass (Zostera marina). Wray and Davis (1959) noted a great decrease in numbers in the 1930's when a blight attacked the eelgrass. Bellrose (1976) commented that fewer Brant reach North Carolina in winter now than in the past, and he mentioned that only a few hundred winter in Currituck and Pamlico sounds, where they used to be abundant. The 1975 January waterfowl census reported only 400 Brant in North Carolina and none elsewhere in the southeast (Goldsberry et al. 1980). This figure represents only 0.5% of those counted in the Atlantic Flyway and only 0.2% of the total number of Brant counted.

Larger numbers occasionally winter in North Carolina. During the severe winter of 1976-77 large numbers were found along the coast where the species is usually uncommon; a peak of 1,650 occurred at Pea Island on 15 February 1977 (LeGrand 1977a).

South Carolina Bellrose (1976) commented that Brant are found only rarely and in small numbers as far south as South Carolina. Sprunt and Chamberlain (1949) called the Brant a rare winter resident in South Carolina; only one of their five records, between 30 November and 31 January, was of a flock. Burton (1970) summarized four additional records of only a few birds each. The most recent record is from well inland in 1974 (Teulings 1975a).

Georgia There are but four records of Brant from Georgia over a period of 80 years (Denton et al. 1977); the latest is from Harris Neck NWR, 14 February 1971 (Teulings 1971b).

Florida Sprunt (1954, 1963) called Brant accidental in Florida and cited only eight records. Kale (1979 ms a) regarded it as rare along the Atlantic coast, with no more than two or three birds seen at one time. Since 1970 there have been six reports, including a few birds that lingered well into spring (Stevenson 1971, 1974, 1978; Kale 1971; Edscorn 1976). Only a few of the records are from the Gulf coast (Edscorn 1976).

Alabama Imhof (1976b) listed only two records of Brant in Alabama, both inland. A third record is of a Brant that remained at Hoover Lake, near Birmingham, from 2 November 1975 until 1 May 1976 (Hamilton 1976, Imhof 1976a, Purrington 1976).

Mississippi There are two records of Brant in Mississippi; the most recent was of a single bird seen off Ship Island on 1 July 1978 (Jackson and Cooley 1978b). The other record, a lone bird off Pass Christian in January 1961, was considered to be possibly the same bird seen in New Orleans two months earlier (Lowery 1974).

Louisiana Lowery (1974) reported two records of eastern Brant for Louisiana, one in New Orleans from November 1960 to January 1961, and one in the Rockefeller Refuge in Cameron Parish, January 1974. In addition, a Black Brant (the Pacific subspecies) was reported at the East Jetty, Cameron, Cameron Parish, on 21 October 1972 (Purrington 1973a, Lowery 1974).

Texas Oberholser (1974) listed 18 Texas records (including 4 of the Black Brant), that span nearly a century; most are from the Gulf coast counties. A more recent report is of one that was seen at Aransas Refuge, 2 January 1976 (Webster 1976).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Brant breeds in the northern Holarctic between 83°N and 63°N. It nests circumpolarly on arctic islands and coasts (BOU 1971) and is one of the northernmost breeding birds in the world (Bellrose 1976).

The size of the breeding population in both the New and Old Worlds is poorly known. One of the largest known breeding populations occurs on the outer Yukon-Kuskokwim Delta; Bellrose (1976) thought it might contain about 75,000 breeding Brant.

Winter Bellrose (1976) indicated that an average of about 217,000 Brant wintered in North America through the early 1970's; about 140,000 of them along the Pacific coast, the rest along the Atlantic. He also pointed out that the Brant along the Pacific coast were shifting their wintering range southward, resulting in a great increase in the number wintering on the mainland coast of Mexico. Bellrose reported that the number increased from 1,400 in 1949 to 41,300 in 1967. This trend apparently continued. The 1975 winter waterfowl survey found 115,340 (Goldsberry et al. 1980) wintering along the west coast of Mexico. This figure represents about 54% of all Brant counted on the January survey of North American waterfowl, and about 93% of those counted along the Pacific coast. About 146,470 wintered along the Pacific coast during the winter of 1976-77 (Ogilvie 1978). Another 100 winter in British Columbia (Bellrose 1976), and up to 5,000 may winter in Cold Bay and Izembeck Lagoon in Alaska (Palmer 1976a); both areas are north of those covered by the January survey (Bellrose 1976).

Bellrose (1976) reported that most (150,000) of the average population wintering in the Atlantic (177,000) wintered in New Jersey, with other substantial wintering populations present in the bays of Long Island, New York (25,000) and Virginia (8,000); only a few hundred winter in the states to the south.

Atlantic Brant numbers fluctuate dramatically in response to varying weather conditions on the breeding grounds and availability of food in winter (Bellrose 1976). Populations in the Atlantic Flyway were about 87,600 in 1974 (Bellrose 1976) and about 88,500 in 1975 (Goldsberry et al. 1980).

The 1976 winter survey (Larned et al. 1980) reported a larger wintering population (ca. 249,000), but the distribution of this population remained much the same. The largest numbers (122,100) wintered off Mexico, and the next two largest populations occurred in New Jersey (99,000) and New York (17,000). Virginia (6,900) and Washington (7,500) also had relatively large wintering populations. In the winter of 1976-1977, Atlantic Brant numbered about 115,400. The severe winter resulted in mass starvation and less than 40,000 survived into the spring (Ogilvie 1978).

Considerable numbers winter in the Old World. During the mid-1970's an average of about 80,000 Brant wintered in northwestern Europe (Ogilvie 1978). A compilation of the most recent figures listed by Ogilvie indicates a wintering population on the order of 122,000 birds, with over 80,000 of them wintering in Britain and France. Small numbers also winter in the Far East. The January 1976 count in Japan revealed fewer than 100 birds, but Ogilvie (1978) guessed that the total population might contain as much as 10,000 Brant.

Migration The primary migratory route followed by North American Brant wintering along the Pacific coast extends overwater to the west coast of California from Izembeck Bay in Alaska where a majority of this form (the Black Brant) may congregate. Birds wintering in the western Atlantic follow two routes. The principal one is overland from James and Hudson Bay to the St. Lawrence Estuary and then to Long Island Sound (Bellrose 1976) and/or New Jersey (Palmer 1976b). Some of the birds on the overland route follow the Susquehanna River to New Jersey and continue south along the east shore of Chincoteague Bay to Virginia and North Carolina (Palmer 1976a).

The other primary migration route, one that Bellrose (1976) believed considerably less important, follows the coasts of New Brunswick and New England to Long Island; some of these birds proceed south along the coast to the southeastern states. Further details of migratory routes and chronology of migration for New World Brant are provided by Bellrose (1976) and Palmer (1976a); the latter, Cramp et al. (1977), and Ogilvie (1978) summarize this information for Old World populations.

Brant may occur off the coast of California as early as mid-October but the peak flights usually occur in mid-November. Birds wintering in the west Atlantic may arrive in New Jersey as early as early October, but the peak occurs later in the month, with some moving as late as early November (Bellrose 1976). Concentrations at Barnegat Bay, New Jersey, have reached as many as 100,000 Brant in late October; most remain there until mid-May (Palmer 1976a). Most of the migration into the Chesapeake Bay region, just north of the study area, occurs between late October and early December (Stewart 1962); some may arrive as early as early September (Palmer 1976a). The return migration peaks there between late February and early April (Stewart 1962).

HABITAT

Breeding Brant breed in coastal tundra, usually just above high tide line. This makes the nesting grounds highly susceptible to flooding by storm tides (Johnsgard 1975, 1978; Ogilvie 1978). Cramp et al. (1977) indicated that this species is often colonial when nesting on small islands near the sea or in lakes. Nests elsewhere may be more dispersed but are usually within a few hundred meters of the tideline. Atlantic Brant prefer grassy tundra along river valleys or near seacoasts. Those nesting in the Yukon Delta are found either along the coast or along major estuaries flanked by tidal meadows. In these areas, nests are mostly found on small islets or along the shores of tidal ponds (Lensink in Bellrose 1976). On the Anderson Delta, nests are placed on grassy hummocks surrounded by tidal flats; the nests average only 3 to 7 in above the high water and in one year averaged only 20 ft from both standing water and snow cover (Barry 1966 in Bellrose 1976). The great majority of those nesting on Southhampton Island are on low sites within a mile of shore or high tide. They often nest on flotsammed sea wrack and kelp driven ashore by storms (Palmer 1976a).

Feeding Ogilvie (1978) indicated that the principal feeding habitat of Brant is estuarine mudflats and sheltered seacoasts. They also graze in saltmarshes and have been reported grazing on habitats as diverse as athletic fields and airports (Palmer 1976a). Fields of grass and winter wheat have also been used by foraging Brant in Europe (Cramp et al. 1977, Ogilvie 1978), and field feeding has been noted in North America as well (Bellrose 1976). Brant also frequent gravel bars and spits to ingest grit (Palmer 1976a).

Winter and Offshore Along the Atlantic coast, Brant winter on shallow flats on salty coastal bays, particularly along the barrier-beach side of bays (Johnsgard 1975). They sometimes occur in areas of brackish water, but concentrate in salt-water shallows where sea lettuce (Ulva), eelgrass (Zostera), or wigeon grass (Ruppia maritima) grow. Those wintering along the Pacific coast prefer large shallow areas, usually bays, covered with eelgrass (Zostera) (Johnsgard 1975).

FOOD AND FEEDING BEHAVIOR

Feeding Brant are principally grazers that uproot the entire plant, eat the roots and lower stems, and discard the fronds; the latter are eaten later on the incoming tide, when dabbling is impossible (Oberholser 1974). When feeding in shallow areas with much eelgrass (Zostera spp.), such as Izembeck Bay, Alaska, these Brant may graze, tip up like puddle ducks, or submerge their heads and necks to pluck vegetation (Ogilvie 1978). With the loss of eelgrass in the 1930's, Brant began feeding in fields. In these areas, they feed in flocks much more compact than those formed by birds feeding on mudflats (Ogilvie 1978). In Britain, these geese have also been seen "pattering" on mud with their feet to bring worms to the surface; in a number of areas they have also been recorded "trampling" to obtain rhizomes of eelgrass. Brant also seize plants brought to the surface by diving ducks (Palmer 1976a).

Brant feed largely by day (Palmer 1976a) but will also feed by moonlight (Cramp et al. 1977). Feeding inshore is closely related to the tidal cycle. Birds forage on mudflats during low tide (Palmer 1976a) and often rest at sea during high tide. The number of feeding peaks is dependent on the number of low tides occurring during the day (Ogilvie 1978).

The diet of Brant is almost entirely vegetable (Palmer 1976a); the small amounts of animal food reported are apparently ingested only by accident (Ogilvie 1978). Eelgrass (Zostera spp.) is usually the primary food, when available. In the western Atlantic, Zostera marina is the species eaten; Zostera marina and Z. nana are the most important species in Europe (Palmer 1976a). An alga, sea lettuce, (Ulva spp.) is also an important food in both the New World (U. lactua; Palmer 1976a) and in the Old (both U. lactua and U. latissima; Cramp et al. 1977). Widgeongrass is an important food for Brant wintering off the western Atlantic coast. Other plants important in the diet in one area or another include other algae (especially Enteromorpha spp.), buds of Saxifraga oppositifolia, rockgrass (Phyllospadix), glasswort (Salicornia), saltgrass (Distichlis spicata), cordgrass (Spartina), a grass (Puccinella), and sea-aster (Aster tripolium). Various grasses and domesticated plants obtained while feeding in fields may also be important in the diet, particularly in Europe. Brant in Denmark have been noted feeding on grain-filled pellets ejected by Herring Gulls (Fog 1967 in Cramp et al. 1977). Mosses, lichens, berries, and sedges are also consumed (Bellrose 1976, Palmer 1976a, Cramp et al. 1977, and authors cited therein). These authors should be consulted for much more detailed lists of foods consumed in various parts of the range.

Little is known of food habits in the southeastern United States, but the diet is presumably similar to that in other areas along the Atlantic seaboard. Cottam et al. (1944) reported the stomach contents of 11 Brant collected in North Carolina prior to the disappearance of eelgrass (Zostera marina) from the east in 1932. They contrasted these with the contents of 21 stomachs collected since 1932. The birds collected prior to 1932 fed almost solely on eelgrass and widgeongrass. The stomachs contained from 10 to 100% eelgrass (mean = 69.5%) and from 8 to 90% widgeongrass (mean = 28.2%). Stomachs collected since 1932 contained 24% Zostera and 60% Ruppia.

Authors cited in Palmer (1976a) reported that a bird collected in South Carolina had eaten only sea lettuce.

SUSCEPTIBILITY TO OIL POLLUTION

Birds of the European subspecies of Brant have been victims of oil spills (Joensen and Hansen 1977). In 1966, Brant wintering populations decreased significantly following an oil spill in the Medway Estuary, Great Britain. However, their numbers increased two years after the incident, indicating that ample food supplies had again become available (Harrison and Buck 1968). Because Brant rarely occur along the coast of the southeastern states (except in North Carolina), there is little threat to the population by the development of oil resources in that area. Should oil wash into shallow bays, however, potential feeding areas might be severely damaged.

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WOOD DUCK

(Aix sponsa)

[FR: Canard carolin, GE: Brautente, SP: Pato del bosque de Carolina, Huyoyo]

GENERAL DISTRIBUTION

An endemic North American species, the Wood Duck breeds primarily in eastern North America with the western limits of this part of the range extending from central eastern Saskatchewan to southeast Manitoba thence south to northeastern Nebraska, eastern Missouri, extreme southeastern Oklahoma, and eastern Texas. They breed east through southern Ontario and Quebec to northern Maine, Nova Scotia, and Prince Edward Island and south through the eastern United States to the Gulf coast, Florida, and Cuba. A disjunct population breeds in the Pacific Northwest from southern British Columbia to northern Idaho and Oregon and south through eastern Oregon and California to southern California (Palmer 1976b). In winter, only the southern parts of the range are occupied. Thus, the species is a common permanent resident in the southeastern states, and an influx of northern birds takes place in winter (Map 7). Estimated breeding populations in the states on the southeastern coast total 289,000 birds (Bellrose 1976). The breeding habitat is primarily wooded bottomlands and swamps. Some birds occur in tidal estuaries and protected coastal marshes in winter (Palmer 1976b).

Because of excessive hunting and habitat destruction, the Wood Duck population was greatly reduced at the turn of the century. A moratorium on hunting, following passage of the Migratory Bird Treaty Act, and intensive management, including the placement of artificial nesting boxes, permitted the species to regain much of its former abundance (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

There is no information available on the history of oiling in this species. However, since the Wood Duck is an interior species largely restricted to freshwater situations with quiet water, it probably seldom encounters oiling from offshore development.

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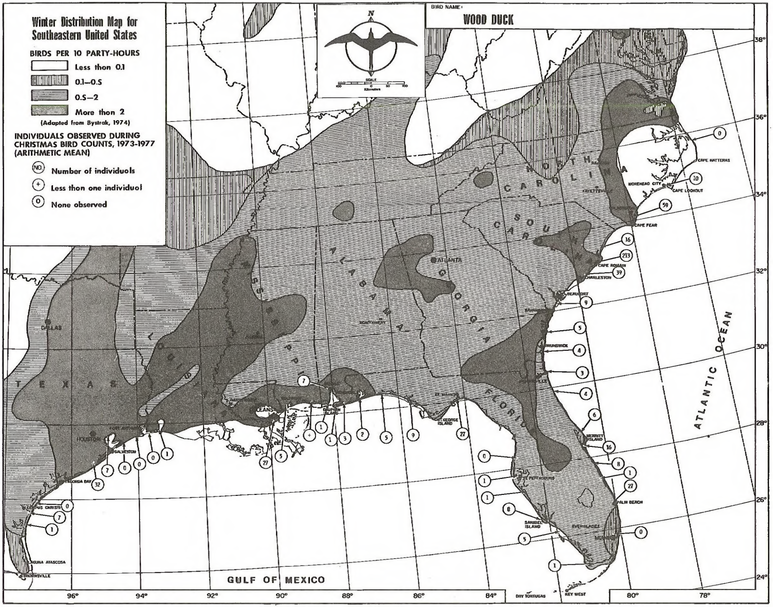
Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less thon 0.1
0.1–0.5
0.5–2
More thon 2
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuols
+ Less thon one individuol
0 None observed
N
SCALE
Kilometers
BIRD NAME:
WOOD DUCK
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
ATLANTIC OCEAN
GULF OF MEXICO
CAPE HATTERAS
MOREHEAD CITY
CAPE LOOKOUT
FAYETTEVILLE
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
BRUNSWICK
ATLANTA
MONTGOMERY
ST. GEORGE ISLAND
DAUPHIN ISLAND
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
DRY TORTUGAS
KEY WEST
DALLAS
HOUSTON
GALVESTON
PORT ARTHUR
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
96°
94°
92°
90°
88°
86°
84°
80°
78°
38°
36°
34°
32°
30°
28°
26°
24°
0
10
59
16
213
39
9
5
4
3
4
6
16
8
1
27
0
0
1
1
0
5
1
27
9
5
2
3
1
1
+
7
5
27
1
0
0
0
7
32
0
7
1

Map 7

Graham, B. J. 1980. Nest hole competition between Wood Ducks and Hooded Mergansers. Jack-Pine Warbler 58: 36.

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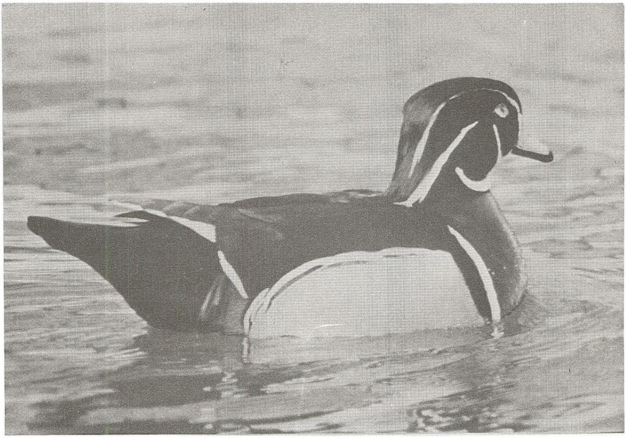

Wood Duck drake in breeding plumage.
Photograph by Roger B. Clapp.

EURASIAN WIGEON

(Anas penelope)

[DA: Pibeand, DU: Smient, EN: Wigeon, FI: Haapana, FR: Canard siffleur, Siffleur d'Europe; GE: Pfeifente, IC: Raudhofdaond, IT: Fischione, JA: Hidorigame, NW: Brunnakke, PO: Swistun, PR: Assobiadeira, Piadeira; SP: Pato europeo, Anade silbon; SW: Blasand, US: European Wigeon]

GENERAL DISTRIBUTION

As its name implies, the Eurasian Wigeon is an Old World species of duck, occurring as a breeding bird from Iceland across subarctic and northern Europe and Asia to the Bering Sea (AOU 1957, Cramp et al. 1977). In winter it moves to southern Europe and Asia and into northern and central Africa (Cramp et al. 1977). The species may breed in the Aleutians, where it is at least a casual visitor in summer (Kessel and Gibson 1978). The Eurasian Wigeon occurs irregularly as a migrant and winter visitor in much of the United States; most observations are of single birds. Hasbrouck (1944) summarized early records. Observations reported in American Birds over the past decade (compiled for this report) indicate occurrences in the southeastern states as follows: North Carolina, 6; South Carolina, 2; Georgia, 3; Florida, 7; Alabama, 1; Texas, 1.

SUSCEPTIBILITY TO OIL POLLUTION

Buck and Harrison (1967) correlated decreased counts of birds in the Medway Estuary in Great Britain with damage to food sources following oil pollution and emulsifier treatment. The Eurasian Wigeon occurs primarily along the coasts in North America (Bellrose 1976, Palmer 1976a) but is such an uncommon visitor in the southeastern United States that development of resources in that area is not likely to have any effect on the population of the species.

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Taxonomic note: Until 1973 this species was regarded by the AOU as Mareca penelope, and is called the European Widgeon by the AOU Check-list (AOU 1957) and by Bellrose (1976). We prefer to list it as the Eurasian Wigeon, as did the American Birding Association (ABA 1975) and Palmer (1976a), because this common name better reflects the world distribution of this duck.

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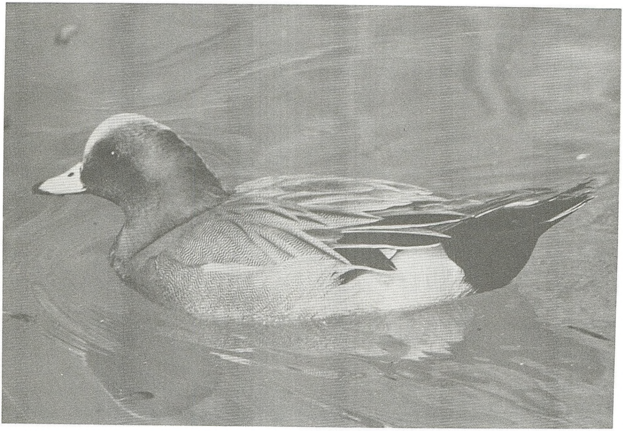

Eurasian Wigeon. Photograph by Roger B. Clapp.

AMERICAN WIGEON

(*Anas americana*)

[DA: Amerikansk Pibeand, DU: Amerikaanse Smient, EN: Baldpate, American Widgeon; FR: Canard siffleur d'Amerique, GE: Nordamerikanische Pfiefente, IC: Ljoshofda-ond, IT: Fischione americano, JA: Amerika hidori, NW: Blesand, Amerikansk lyngand; PR: Pato, SP: Anade silbon americano, Pato americano, Pato lablanco, Pato cabecilargo, Moniblanco; SW: Amerikansk blasand]

GENERAL DISTRIBUTION

The American Wigeon breeds across northern North America from the Bering Sea and interior Alaska to Hudson Bay, and south to northeastern California, Utah, Minnesota, and southern Manitoba (AOU 1957). In recent years there has been an apparent expansion of the breeding range to the east, with scattered reports of nesting from southern Ontario and Quebec, Prince Edward Island, Nova Scotia, New Brunswick, and Maine (Palmer 1976a, Spencer 1977). From 1955 to 1973, the average North American breeding population was about 3,139,000 birds, with an annual production of about 3,296,000 young (Bellrose 1976). In winter these ducks occur along the Pacific coast of North America from southern Alaska to Costa Rica and along the Atlantic seaboard from New England south through much of Mexico and the West Indies, sometimes reaching South America (AOU 1957, Bond 1971, Palmer 1976a). In winter the American Wigeon is a common bird along the southeastern coast (Map 8). Recent estimates (Bellrose 1976) suggest winter populations of 29,000 in Currituck Sound, North Carolina; 60,000 in the marshes of South Carolina; 20,000 in Florida; and up to 300,000 in the extensive coastal marshes of Louisiana, where even more are present in fall migration.

SUSCEPTIBILITY TO OIL POLLUTION

Although the American Wigeon occurs in coastal marshes and estuaries, we have no records of oiling in southeastern waters. The species is one of the more terrestrial of the dabbling ducks (Palmer 1976a), and as a result, we believe this species will not be severely affected by offshore development in the southeastern United States. They should be most adversely affected if oil were to inundate shoreline and marshy areas where most are found.

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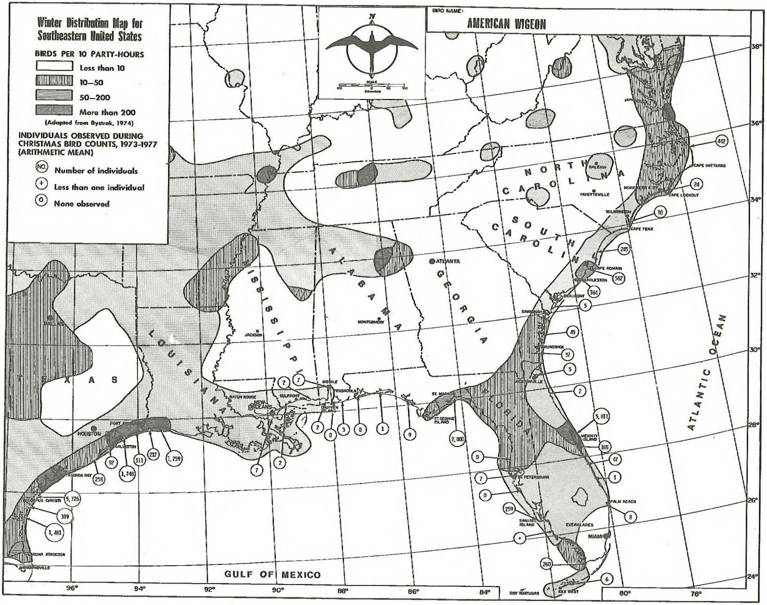
Taxonomic note: Until 1973 this species was regarded by the AOU as *Mareca americana*.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
AMERICAN WIGEON
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
HOUSTON
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
ST. MARKS
ST. GEORGE ISLAND
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
CAPE HATTERAS
MOREHEAD CITY
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
442
24
10
245
562
384
5
45
37
5
2
5,811
105
47
1
8
6
260
+
259
0
7
0
2,000
9
1
0
3
0
2
2
7
7
2
1,759
217
511
1,748
92
258
5,726
319
1,481
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 8

1980

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1919

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1916

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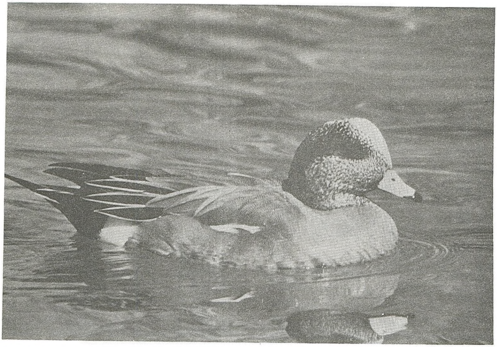

American Wigeon drake. Photograph by Roger B. Clapp.

GADWALL

(*Anas strepera*)

[DA: Knarand, DU: Krakeend, FI: Harmaasorsa, FR: Canard chipeau, GE: Schnatterente, IC: Gargond, IT: Canapiglia, JA: Oka yoshigamo, NW: Snadderand, PO: Krakwa, PR: Frisada, RU: (Gray Duck), SP: Pato ruidosa, Anade friso; SW: Snatterand]

GENERAL DISTRIBUTION

The Gadwall breeds in southern Alaska, the southern Prairie Provinces of Canada, southern Ontario (AOU 1957, Godfrey 1966), and in the western and central United States (AOU 1957, Johnsgard 1975). In recent years there has been an increase in breeding in the eastern United States (Henny and Holgersen 1974), including all the coastal states to South Carolina. In winter Gadwalls occur throughout the southern half of the United States, most of Mexico, and the Caribbean islands (AOU 1957, Bond 1971). An Old World portion of the population breeds from Iceland across northern Eurasia and winters in southern Europe, northern Africa, the Middle East, China, and Japan (Delacour 1954, Johnsgard 1978).

The North American breeding population has been estimated at about 1,615,000 birds in recent years (Bellrose 1976), with the most important breeding grounds in the Prairie Provinces of Canada and in the Dakotas. In winter the species is locally common in the southeastern United States (Map 9), but large concentrations are found in the coastal marshes of Louisiana. In recent years, population estimates in Louisiana ranged from 570,000 in 1972 to 938,000 in 1969 (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

Records in the banding office at Patuxent National Research Center indicate that at least two Gadwalls have died as a result of oiling, one in Texas and one in Louisiana. Death from oiling is evidently uncommon to rare in this species, for we found no other records. The Gadwall occurs primarily in fresh water and in brackish marshes and estuaries. Because of its inshore habits, this species is not likely to be particularly vulnerable to oil pollution.

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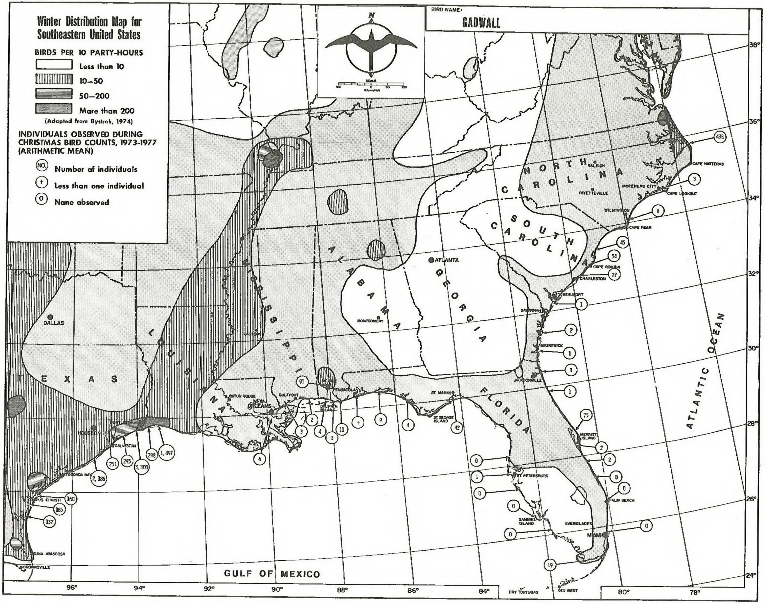
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10—50
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(NO.) Number of individuals
(+) Less than one individual
(0) None observed
N
SCALE
Kilometers
BIRD NAME:
GADWALL
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
DAUPHIN ISLAND
PENSACOLA
JACKSON
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
PALM BEACH
MERRITT ISLAND
DRY TORTUGAS
KEY WEST
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
CAPE LOOKOUT
MOREHEAD CITY
CAPE HATTERAS
RALEIGH
FAYETTEVILLE
160
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132
2,186
251
295
3,300
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Map 9

1979

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1952

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1950

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1949

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GREEN-WINGED TEAL

(*Anas crecca*)

[DA: Krikand, DU: Wintertaling, EN: Teal, FI: Tavi, FR: Sarcelle d'hiver, GE: Krickente, IC: Urtond, IT: Alzavola, JA: Kogamo, NW: Krikkand, PO: Cyranoeczka, PR: Marreco, RU: (Whistling Teal), SP: Cerceta de alas verdes, Cerceta comun; SW: Kricka, US: European Teal]

GENERAL DISTRIBUTION

The North American subspecies of the Green-winged Teal (*A. c. carolinensis*) breeds from northern Alaska and the western Mackenzie District east to the southern Hudson Bay region, northern Quebec, Labrador, and Newfoundland; south to California, the northern Great Basin, Colorado, central Nebraska, western Minnesota, and southern Ontario and Quebec, with small disjunct populations outside this general range (AOU 1957, Bellrose 1976, Palmer 1976a). Scattered records indicate Green-winged Teal formerly bred regularly in the northeastern United States. In winter the species occurs from southern British Columbia south through the southern two-thirds of the United States to the Atlantic seaboard, through Mexico and Central America to northern South America, and in the West Indies. A Eurasian subspecies breeds widely across northern Europe and Asia, wintering in southern Europe, northern Africa, and southeastern Asia (Cramp et al. 1977). A third subspecies is resident in the western Aleutians (AOU 1957).

The Green-winged Teal is a common winter bird in all the southeastern states to central Florida (Map 10). Bellrose (1976) estimated that the 55,000 present in South Carolina represent about 70% of the birds wintering along the southern Atlantic coast. More than half the wintering birds in the United States may be found in the Mississippi Flyway, and some 600,000 of those utilize the coastal marshes and ricefields of Louisiana (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

Although primarily a bird of fresh water and inland ponds and lakes, Green-winged Teal frequently winter in coastal marshes and estuarine areas in the southeastern United States, particularly along the Gulf shores of Louisiana and Texas. Chabreck (1973) documented oil spill damage to coastal ponds of the type used by this species in Louisiana, and showed that use of these ponds by waterfowl was significantly less than in un-oiled areas. In addition, Vereschagin (1946 *in* Vermeer and Vermeer 1974) reported that this teal (*Anas c. crecca*) is one of the most affected species inland in Azerbaidzhan. This suggests that serious damage to Green-winged Teal could occur if oiling in coastal marsh areas

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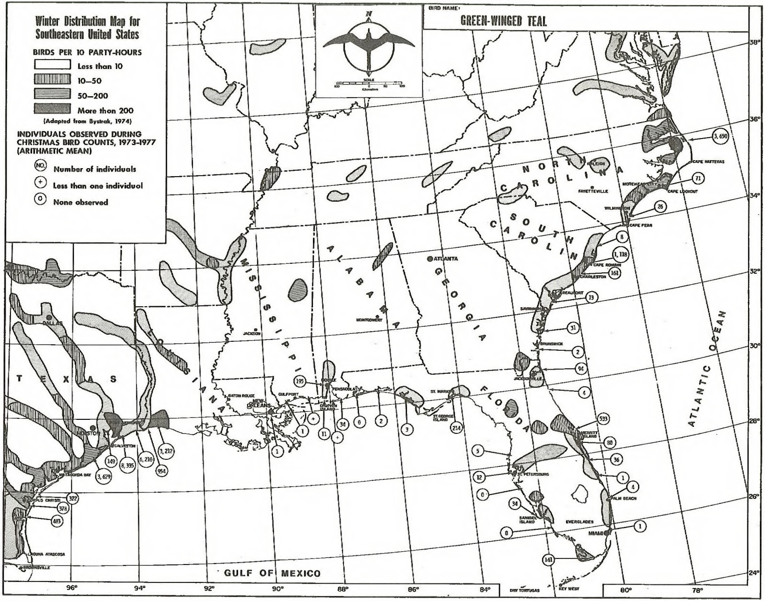
Taxonomic note: The American Green-winged Teal (*Anas crecca carolinensis*) was not regarded by the AOU as a full species (*Anas carolinensis*) until 1973.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+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
GREEN-WINGED TEAL
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
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PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
3, 650
71
26
8
1, 118
161
13
31
2
94
4
533
80
36
1
4
1
141
0
34
0
12
5
214
3
2
0
34
+
11
+
1
195
1
3, 212
954
6, 210
8, 335
149
3, 629
322
378
483
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 10

were widespread. Oil spills in more marine areas and offshore will probably have little effect.

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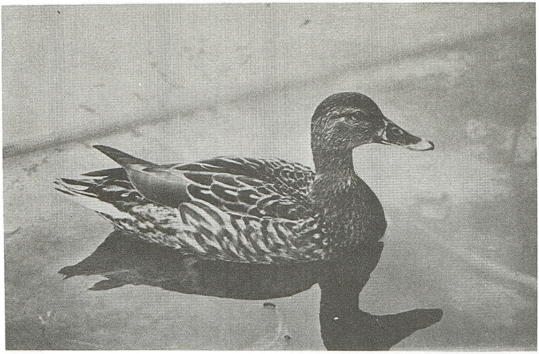

Vagrant Mallard on French Frigate Shoals, Northwestern Hawaiian Islands, November 1980. Photograph by Roger B. Clapp.

MALLARD

(*Anas platyrhynchos*)

[DA: Graand, DU: Wilde eend, FI: Heinasora, FR: Canard col-vert, GE: Stockente, IC: Stokkond, IT: Anitra selvatica, Germano reale; JA: Magamo, NW: Stokkand, PO: Krzyzowka, PR: Pato-real, SP: Pato comun, Anade real; SW: Grassand]

GENERAL DISTRIBUTION

In North America, the Mallard breeds from Alaska and northern MacKenzie across Canada to the southern shore of Hudson Bay and southern Quebec, south to central California, central Nevada and Utah, New Mexico, Oklahoma, Missouri, Ohio, and Virginia, occasionally farther south (AOU 1957, Bellrose 1976). In recent years Mallards have been released, intentionally or accidentally, in many areas south of the historic range; many of these have bred, and the natural range is difficult to determine. In southern Arizona and New Mexico and western Texas, typical green-headed Mallards intergrade with a monomorphic female-plumaged population (*A. p. diazi*) which is resident in the central Mexican highlands (Hubbard 1977). In winter the Mallard occurs throughout most of the United States and in Mexico (AOU 1957, Palmer 1976a). Mallards are also widespread through Eurasia and there is a subspecies in coastal Greenland (AOU 1957, Palmer 1976a, Cramp et al. 1977).

The North American estimated breeding population of the Mallard ranged from about 6.1 (1965) to 14.5 (1957) million birds between 1955 and 1969, with an average of 9.6 million. The late summer population in North America during these years averaged about 19.5 million, and the harvest was about 3.5 million (Anderson and Henny 1972). The species is common in all the southeastern states (Map 11). The Mississippi Flyway is an important corridor for the Mallard, and of the estimated 3.1 million birds (the average in 1960-1970) using it annually, about 400,000 wintered in the coastal Louisiana marshes. Many fewer birds use the Atlantic Flyway, but of those that do, about 110,000 winter in southeastern South Carolina and 40,000 in the Chesapeake Bay region (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

Mallards have suffered casualities from coastal oiling incidents (Smith 1973, Table 3). They are also prone to problems at inland oil-sumps (King 1953). In the Caspian Sea region, Mallards have been the inland species most affected

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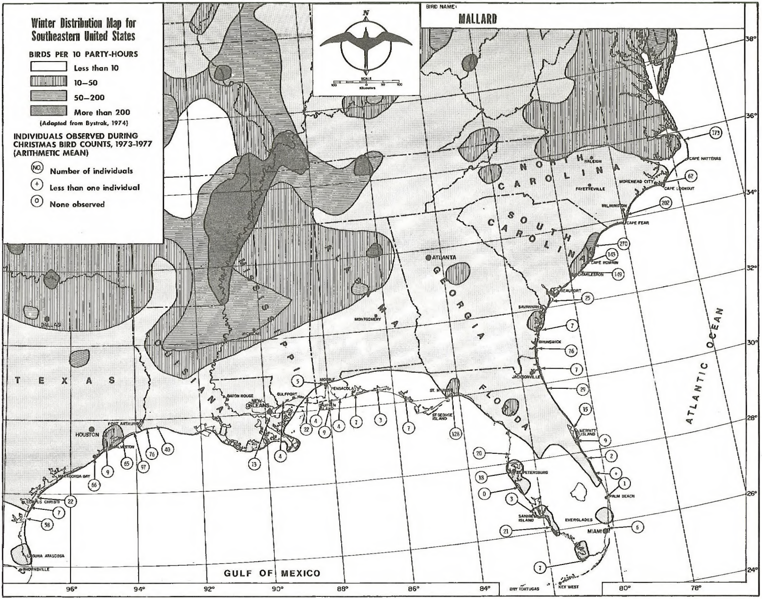
Taxonomic note: In general, this account deals only with the "typical" green-headed Mallard, although the North American range includes the "Mexican Duck", *Anas p. diazi*, formerly recognized as a species. The Mottled (including Florida) Duck, *A. fulvigula*, although treated by some authors (Johnsgard 1975, Bellrose 1976) as one or more subspecies of Mallard, is treated here as a distinct species, as are various insular populations, well outside the geographic scope of this report, that associate with the Mallard in some winters.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO.
Number of individuals
+
Less than one individual
0
None observed
N
SCALE
Kilometers
BIRD NAME:
MALLARD
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
HOUSTON
CAPE HATTERAS
173
MOREHEAD CITY
62
CAPE LOOKOUT
WILMINGTON
202
CAPE FEAR
270
143
CAPE ROMAIN
CHARLESTON
149
BEAUFORT
25
SAVANNAH
7
BRUNSWICK
76
7
JACKSONVILLE
29
15
MERRITT ISLAND
9
2
+
1
PALM BEACH
EVERGLADES
MIAMI
6
7
KEY WEST
DRY TORTUGAS
21
SANIBEL ISLAND
3
0
18
ST. PETERSBURG
20
128
ST. MARKS
ST GEORGE ISLAND
7
3
7
4
9
4
22
DAUPHIN ISLAND
PENSACOLA
MOBILE
5
GULFPORT
NEW ORLEANS
BATON ROUGE
4
13
40
76
97
65
PORT ARTHUR
GALVESTON
9
66
MATAGORDA BAY
CORPUS CHRISTI
22
7
58
LAGUNA ATASCOSA
BROWNSVILLE
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 11

by marine oil pollution (Vereshchagin 1946). Artificial feeding of oil caused a reduction in mobility accompanied by diarrhea, loss of balance and coordination, and tremors (Hartung 1963). Ingested oil has also been demonstrated as interfering with egg-laying (Hartung 1963).

In the southeastern United States, most Mallards frequent fresh water or brackish or estuarine bays and marshes. Few appear in salt water (Stewart 1962). In addition, the portion of the total population wintering in the southeastern states is small. The risk to Mallards of oil development in that area is therefore relatively low.

Table 3. Number of dead birds and number and percentage of dead Mallards found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Mallards	Percentage of Mallards	Source
Poole Harbour, Dorset, England	Jan. 1961	433 (a,b)	2	0.46	Bourne 1968a
Medway Estuary, Kent, England	Sept. 1966	2,748 (a)	36	1.31	Bourne 1968a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (b)	1	0.09	Greenwood and Keddie 1968
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	2	0.08	Joensen 1972b
Northeast Britain	Jan.-Feb. 1970	10,992 (a,c)	8	0.07	Greenwood et al. 1971
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	1	0.02	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	3	0.03	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,c)	9	0.23	Gorski et al. 1976
Firth of Forth, southern Scotland	Feb. 1978	680 (a)	1	0.14	Campbell et al. 1978

(a) Total includes only those birds identified to species.
(b) Total includes both live and dead oiled birds.
(c) Total includes some birds that were not oiled.

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MOTTLED DUCK

(Anas fulvigula)

[US: Mottled Mallard, Dusky Duck, Florida Duck, Florida Mallard]

GENERAL DISTRIBUTION

North America The Mottled Duck is a resident of peninsular Florida and the Gulf coast from Alabama (Imhof 1976b) and Mississippi (Hackney and Hackney 1976) south through coastal Tamaulipas at least to Tampico (Palmer 1976a). The western race winters in the breeding range and south to the Alvarado marshes in Veracruz (Leopold 1959 in Palmer 1976a); stragglers have been taken in Kansas, Oklahoma, and at two localities in Colorado (Palmer 1976a). Mottled Ducks bred on the Cheyenne Bottoms Wildlife Refuge, Barton County, Kansas, in 1963 (McHenry 1968).

World Distribution The Mottled Duck is restricted to North America.

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

Georgia Burleigh (1958) listed this species as accidental in Georgia on the basis of a single specimen from Cumberland Island, taken 23 December 1902.

Florida The Mottled Duck occurs throughout the year in peninsular Florida south of a line extending from Cedar Key to Gainesville to Daytona Beach, with about 60% of the population found in Hendry, Lee, Charlotte, and Glades counties (E. B. Chamberlain 1960 in Bellrose 1976). Early fall populations have been estimated at 50,000 birds (Bellrose 1976).

Kale (1979 ms a, 1979 ms b) considered it rare north of Merritt Island on the Atlantic coast and north of Chassahowitzka NWR on the Gulf. To the south, there are sight records from Key Largo (Palmer 1976a), Summerland Key (Stevenson 1978), and Key West (Edscorn 1978).

Alabama Imhof (1976b) considered the Mottled Duck an uncommon local resident of the Alabama Gulf coast. Breeding birds have been found at Dauphin Island in May and at Gulf Shores in June. The Mottled Duck is more widespread outside the breeding season and has been recorded north to the head of Mobile Bay. Imhof (1976b) suggested that non-breeding birds in such areas are most often found in salt water and brackish marshes.

Taxonomic note: Considered by Johnsgard (1975, 1978) as a subspecies of Mallard (Anas platyrhynchos), but only one form, A. fulvigula, is recognized by Palmer (1976a). Others (AOU 1957, Bellrose 1976) have divided fulvigula into two races: A. f. fulvigula, the Florida Duck; and A. f. maculosa, the Mottled Duck or Mottled Mallard of the Gulf coast.

Mississippi Hackney and Hackney (1976) considered the Mottled Duck a resident of Mississippi that breeds only in remote coastal marshes. Nests have been found at Claiborne, Lakeshore, and on the west side of Saint Louis Bay (all in Hancock County), where adults of the species are most frequently reported. Eggs have been found from 4 April through 1 July (Hackney and Hackney 1976).

Louisiana Mottled Ducks breed in large numbers in the Louisiana coastal marshes. Although some birds are resident, others, sometimes most of the population, apparently move southward into Texas or Mexico to winter (Lowery 1974). Allen and Perry (1980) examined the gonads of 195 birds obtained in southwestern Louisiana and concluded that the peak reproductive activity of females occurred about 23 April, two weeks later than males. Bateman (in Bellrose 1976) estimated that 39% of the Louisiana population breeds in freshwater marsh, 32% in marsh intermediate between fresh and brackish water, 10% in brackish and saline marshes, and 9% on agricultural land. Early fall populations are thought to contain 75,000 to 120,000 birds.

Texas The Mottled Duck is a resident along the Texas coast where it is locally common to uncommon; a few breeding records are also known from farther inland. Breeding has been recorded from mid-March to August (Oberholser 1974). Maximum breeding densities occur between Sabine Lake and Galveston Bay (Singleton 1953). Stuzenbaker (in Bellrose 1976) estimated that early fall populations contain 60,000 to 100,000 birds.

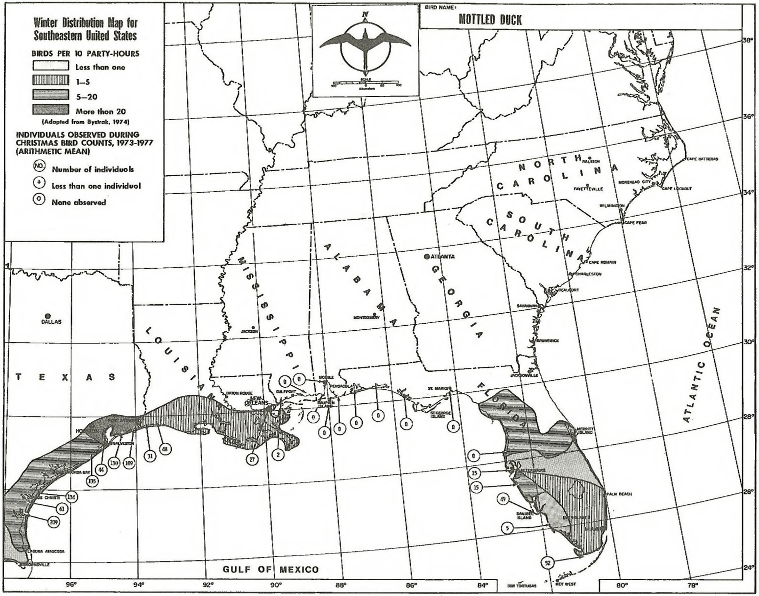
SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding/Winter This species is a year-round resident in central and southern Florida, which harbors about one-fifth to one-sixth of the total population of the species (Bellrose 1976); it is uncommon in the coastal marshes of Alabama and Mississippi, but locally common in coastal Louisiana and Texas where most of the rest of the species breeds. It also breeds south to Tampico and Tamaulipas. Data given in Bellrose (1976) indicate that the total breeding population is 140,000 to 200,000 birds and that early fall populations are about 250,000 to 300,000 birds. Palmer (1976a), on the other hand, reported mid-winter inventories for the conterminous United States of 66,000 to 81,200 birds for the period 1968-1970. In winter some birds move farther south into Mexico to as far south as Veracruz; within the United States they reach their peak abundance along the Texas coast (Map 12).

Migration Most Florida Mottled Ducks are essentially non-migratory but some disperse short distances. Fifty-one (63.0%) of 81 birds banded at various sites in Florida were recovered 10-270 mi (16-434 km) from the banding site, but most (71.4%) were recovered within 49 mi (79 km) of where they were released (Fogarty and LaHart 1972). Palmer (1976a) noted that thousands of the western race winter in Mexico. Other non-breeding birds in Texas wander inland (Oberholser 1974) and eastward into Louisiana (Bellrose 1976).

HABITAT

Nesting Stieglitz and Wilson (1968) reported that Mottled Duck nests on


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
MOTTLED DUCK
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
MOBILE
PENSACOLA
GULFPORT
DAUPHIN ISLAND
BATON ROUGE
NEW ORLEANS
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
PALM BEACH
SANIBEL ISLAND
EVERGLADES
MIAMI
DRY TORTUGAS
KEY WEST
HOUSTON
PORT ARTHUR
GALVESTON
ARANSAS BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
0
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0
0
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0
0
0
0
0
27
2
31
48
109
130
44
135
134
61
209
0
15
15
49
5
52
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 12

spoil islets in and near Merritt Island NWR on the east coast of Florida were located 6-79 ft (2-24 m) from the water (mean = 27.8 ft, or 8.47 m), but most (78.9%, n = 114) were found 10-40 ft (3.1-12.2 m) from water. Excluding cover for nests under Australian pines (*Casuarina equisetifolia*), which Steiglitz and Wilson considered atypical, height of cover ranged from 0.5 to 8 ft (0.15-2.4 m). In favored nesting sites, however, the cover was typically 1.25-2 ft (0.38-0.61 m) tall. Ducks in this study area preferred to nest in pure stands of seashore paspalum (*Paspalum vaginatum*); broomsedge (*Andropogon* sp.) was also commonly used. A few nests were also found among or under wax myrtle shrubs (*Cerothamnus ceriferus*), red mangrove (*Rhizophora mangle*), scrub palmetto (*Sabal etonia*), or Australian pine.

Birds nesting along the Texas coast preferred to nest on slight ridges in heavy stands of saltmeadow cordgrass (*Spartina patens*). In inland areas, preferred sites were in tall cover in abandoned fields, on road sides, and on levees (Singleton 1953).

Feeding and Offshore Mottled Ducks feed in or near the areas in which they nest. We know of no records of their occurring offshore.

FOOD AND FEEDING BEHAVIOR

The Mottled Duck has a relatively varied diet for a dabbling duck and eats more animal foods than do most of the ducks in the genus *Anas*. A few studies have reported in some detail the foods consumed. We have summarized these for Florida and Texas below. According to Palmer (1976a), much the same foods are eaten along the Louisiana coast and his work should be consulted for a list of these, as well as for other foods not mentioned here.

Florida Beckwith and Hosford (1956, 1957) reported the contents of 144 gizzards collected from October 1953 through November 1954 in the vicinity of Lake Okeechobee in Glades County. On the basis of identified material only, these birds consumed an average of 87.2% plant material and 12.8% animal matter. Foods utilized varied from season to season, with the diet composed of as much as 100% plant food (fall, 1953 and 1954; winter 1953-54) or as little as 61% (summer, 1954). Seventy-seven species of plants of 51 genera were consumed. Fall plant foods making up more than 3% (by volume) of the diet in any given year were ragweed (*Ambrosia elatior* - 30.7%), dotted smartweed (*Polygonum punctatum* - 28.3%), a *Panicum* (*agrostoides*? - 17.4%), a *Paspalum* (*cilatifolium*? - 12.4%), and ovateleaved marsh-pennywort (*Centella asiatica* - 3.6%). Major foods during one or the other winters were gulfcoast spikerush (*Eleocharis cellulosa* - 14.6%), the marsh-pennywort (12.2%), Carolina fanwort (*Cabomba caroliniana* - 11.8%), ragweed (8.6%), guava (*Psidium guajava* - 6.4%), dotted smartweed (3.8 to 4.1%), and a beakrush (*Rhynchospora* sp. - 3.4%). The principal plant foods taken during the spring of 1954 were dotted smartweed (23.4%) and Puerto Rico smartweed (*Persicaria portoricensis* - 10.4%), while the major plant foods eaten that summer were Bartow panicgrass (*Panicum bartowense* - 23.8%), dotted smartweed (5.1%), and mudbank paspalum (*Paspalum dissectum* - 4.5%). Animal foods eaten were not as adequately identified by Beckwith and Hosford, but consisted largely of insects, particularly aquatic beetles, and snails.

In a subsequent study, Stieglitz (1972) compared food habits at inland

Loxahatchee NWR with those of a coastal marsh area (Merritt Island NWR). Forty-five gizzards were obtained at Loxahatchee and 40 at Merritt Island. Overall, 89.9% of the food (by volume) was plant matter and 10.0% was animal, but the proportion of plant to animal food and species consumed varied from area to area. At Loxahatchee, 97.3% of the food was vegetable in origin; the most important plants were Tracy's beakrush (Rhynchospora traceyi - 32.8%), dotted smartweed (29.4%), swamp smartweed (Polygonum hydropiperoides - 18.2%), and sawgrass (Cladium jaimaicensis). At Merritt Island, only 81.1% of the diet was vegetable. The most important plants here were spiny naiad (Naias marina - 49.2%), shoalgrass (Diplanthera wrightii - 10.6%), and muskgrass (Chara sp. - 7.3%). Gastropods (6.5%), pelecypods (6.9%), and adult and larval insects (4.6%) were the most important of the animal foods eaten at Merritt Island. Scorched mussel (Mytilus exustus - 2.9% of all food from both localities), common Atlantic marginella (Prunum apicinum - 1.5%), and dragonfly nymphs (Libellulinae - 1.2%) were the most important individual animal foods (Stieglitz 1972).

Texas Singleton (1953) reported the contents of 25 stomachs that were collected from spring through fall in a rice-marsh area in Chambers County. These birds had consumed 41.8% (by volume) plant matter and 52.8% animal matter. Insects (32.9%), jungle rice (Echinochloa colona - 23.8%), and fish (16.2%) were the primary foods taken. The only other foods forming more than 3% of the diet in this sample were gastropods (7.5%), cultivated rice (Oryza sativa - 6.3%), and wild millet (Echinochloa crusgalli - 4.8%). Stomachs collected elsewhere in Texas showed a wide variety of foods. Two stomachs collected in a saline habitat in Aransas County were 90% full of widgeongrass (Ruppia maritima), and four stomachs collected from February through April in Cameron County contained 50% insects, 35% minute snails, and 7% vegetation. The stomach of another bird taken in Calhoun County was almost entirely full of squarestem spikerush (Eleocharis quadrangulata).

Feeding techniques and many other aspects of Mottled Duck feeding behavior have not been studied.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Stieglitz and Wilson (1968) studied breeding Mottled Ducks for two seasons at the Merritt Island NWR in Florida. In 1966, the first egg was laid on 6 March, the last on 25 June. In 1967, the first egg was laid on 11 February and the last on 17 July. Peak nesting periods were 16-31 March in 1966 and 1-15 April in 1967. In both years nest initiation declined in May, and nests found after late May may have been replacement efforts. In Texas, Oberholser (1974) reported egg dates from 18 March to 21 July; Singleton (1953) stated that nesting occasionally occurred as early as February, but usually began in March, with a peak of nesting in April.

Mean Clutch Size In their Merritt Island (Florida) study, Stieglitz and Wilson (1968) had data for 78 complete clutches. Clutch size ranged from 5 to 13 eggs, with a mean of 9.4; the most frequent clutch size was 10 (22 nests). Clutch size decreased as the nesting season progressed. In a study near Lake Okeechobee, Florida, Beckwith and Hosford (1957) found 8 eggs to be the largest and most frequent number found (4 of 5 nests). Singleton (1953) reported that the complete clutch size for 108 Mottled Duck nests in Texas ranged from 7 to 14 eggs, and averaged 10.4.

Incubation Period Stieglitz and Wilson (1968) found that incubation of eggs in the wild took 25-26 days; incubation was defined as the period from the laying of the last egg to the emergence of the last duckling. Singleton (1953) reported that Texas birds incubated from 25 to 27 days.

Hatching Success In 1966 and 1967 at Merritt Island, 93.6% of the 612 eggs in successful nests hatched (Stieglitz and Wilson 1968). However, 21 of 117 nests were not successful. Beckwith and Hosford (1957) reported that 15 of 16 eggs (94%) in two successful nests hatched, but 3 nests containing 21 eggs were destroyed; thus, about 40% of the eggs laid hatched. Singleton (1953) reported a hatching success of 96.2% for Mottled Ducks in Texas, but this may have been only for successful nests.

Fledging Success Data are not available.

Age at Fledging Definite information is not available but Palmer (1976a) estimated the age at first flight to be from 54 to 60 days.

Age at First Breeding Mottled Ducks probably breed in their first year. Weeks (1969) noted that in Louisiana, immature birds pair by mid-winter of their first winter; nearly 90% of all ducks he observed during mid-winter were paired.

Mortality of Eggs and Young Twenty-six of 78 (33%) nests that failed in Texas were lost to predation by domestic dogs (Singleton 1953). Other major sources of nest loss were human disturbances (15%) and burning (14%).

Exceedingly little is known of the factors causing mortality in young birds. Singleton (1953) saw but one instance of predation; in this instance a juvenile was killed by a domestic dog.

Renesting Singleton (1953) stated that the species is single-brooded and reported an observation of one pair renesting five times before eggs were hatched; he also noted several instances of three nesting attempts.

Maximum Natural Longevity An adult male banded in Texas was recovered in the same state at a minimum age of 13 years, 5 months (Clapp et al. in press).

Weight Beckwith and Hosford (1957) reported the mean weight of 30 adult males as 1,030 g (2.27 lb); the mean weight of 11 adult females was 968 g (2.13 lb). Maxima were 1,280 g (2.82 lb) for males, 1,131 g (2.49 lb) for females.

SUSCEPTIBILITY TO OIL POLLUTION

No reports of oiled birds are available. Oil washed into coastal marshes by wave or wind action could affect nests or feeding grounds.

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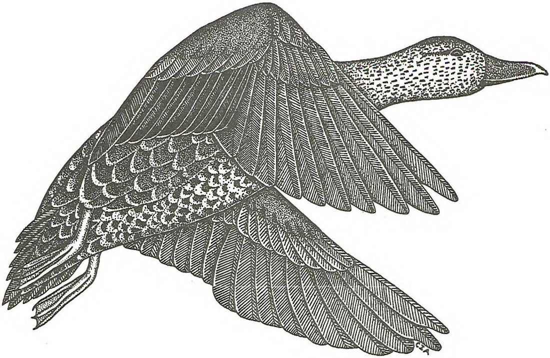


BLACK DUCK

(Anas rubripes)

[FR: Canard obscur, GE: Dunkelente, SP: Pato negro, US: Black Mallard]

GENERAL DISTRIBUTION

North America The Black Duck breeds primarily in the northeastern part of North America and only nests sporadically elsewhere (range maps in Palmer 1976a, Bellrose 1976). Breeding ranges delineated by Palmer and Bellrose vary some, but both authors agree that the northern limits of regular breeding occur from northeastern Manitoba east along the southern shores of Hudson Bay through Quebec and all but the northwestern part of New Brunswick, thence southeast throughout Newfoundland. Western limits of regular breeding extend from eastern Minnesota south to northeastern Iowa. From northeastern Iowa they breed eastward through northern Illinois, northern Indiana, northern Ohio, and northern Pennsylvania. Palmer (1976a) indicated that this species regularly breeds throughout much of Pennsylvania south into northern West Virginia and northeastern Virginia; Bellrose (1976) did not. Both authors agreed that the species breeds regularly along the Atlantic coast to the Cape Hatteras area of North Carolina.

Black Ducks breed or have bred sporadically or locally in small numbers in Alberta, Saskatchewan, North Dakota, Kansas, Tennessee, southern and western Virginia, coastal South Carolina and Georgia, and northern Alabama (Bellrose 1976, Palmer 1976a).

Black Ducks winter in the southern portion of this range, largely within the United States, south to the Gulf coast in extreme eastern Texas and east to central and northern Florida (Bellrose 1976, Palmer 1976a).

World Distribution These ducks occasionally straggle to the Old World where they have been recorded in Ireland, England, the Azores (Palmer 1976a), Sweden (Jonsson 1975), and South Africa (Brooke and Sinclair 1976). They occur regularly in Bermuda in fall and are sometimes seen there in winter (Palmer 1976a).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina Black Ducks are common winter residents of North Carolina and breed in small numbers (Pearson et al. 1942). They rarely breed in the interior (Palmer 1976a, LeGrand 1977b) and are most abundant as breeding birds along the coast (Florschutz 1962), where moderate numbers may be found (LeGrand 1979d).

More Black Ducks winter along the coast of North Carolina than in any other coastal area in the southeast. Winter surveys (1950-1960) indicated an average of 18,300 birds along the coast of North Carolina, with most (17,700) in the northern half of the state (Geis et al. 1971). The 1975 winter survey reported a wintering population of 23,400 birds (Goldsberry et al. 1980).

South Carolina Sprunt and Chamberlain (1949) considered the Black Duck a common winter resident along the coast from 31 August through 1 May, and a much less common visitor inland. Peak numbers are reached in coastal areas during the winter (Map 13).

Winter surveys taken in the 1950's indicated that an average of 15,700 birds wintered along the South Carolina coast. The South and North Carolina coasts are the only major concentration of wintering Black Ducks in the southeast (Geis et al. 1971). The most recent count (winter 1975) reported 9,700 birds on the South Carolina coast (Goldsberry et al. 1980), a considerable decrease from earlier figures.

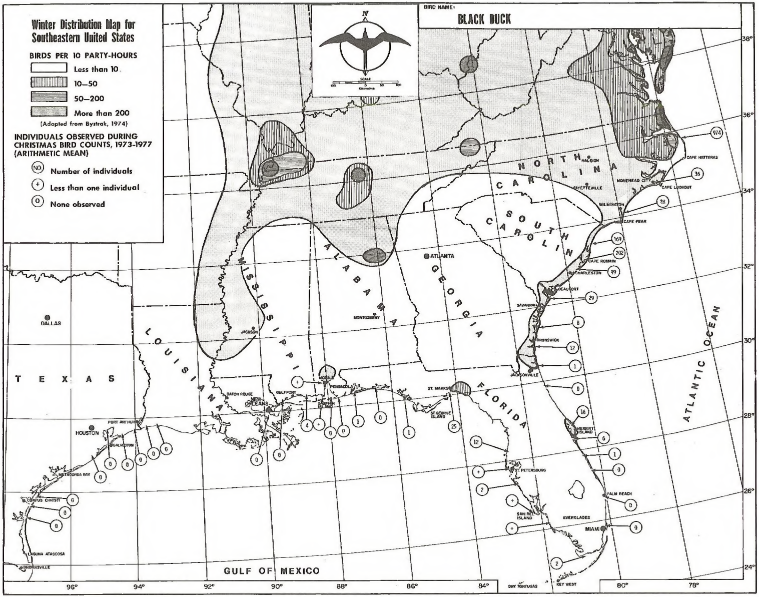
In a very few instances this duck has been found breeding along the southeastern coast (Palmer 1976a); one of these breeding localities was near McClellanville (Sprunt and Chamberlain 1949).

Georgia Denton et al. (1977) considered this species uncommon, a transient and winter visitor throughout the state, and suggested that it may rarely breed in the Piedmont. We have found no certain indication of breeding, but a map in Palmer (1976a) clearly indicates that there are one or more extralimital breeding records from the northeastern coast.

During the 1950's, winter counts averaged 2,800 birds (Geis et al. 1971); only 400 were reported during the winter of 1975 (Goldsberry et al. 1980).

Florida Sprunt (1954) regarded the Black Duck as an abundant winter resident in the northern portion of Florida but as uncommon in central and southern areas of the state; he noted that any occurrence south of Lake Okeechobee was unusual. Most Black Ducks are seen in the state from early October to early April, although a few sometimes remain until late spring. Howell (1932) indicated that the duck occurs most commonly in coastal marshes and tidal creeks but is also on interior freshwater marshes. Kale (1979 ms a) considered the Black Duck uncommon on the Atlantic coast, where winter surveys in the 1950's revealed an average of 2,900 birds (Geis et al. 1971). Recent figures for birds wintering at Merritt Island NWR range from 10 to 150 birds (Kale 1979 ms a). This duck is considered common in winter on the upper Gulf coast south to Chassahowitzka NWR (Kale 1979 ms b, Map 13). Winter counts during the 1950's averaged 9,200 birds (Geis et al. 1971), but the actual number present in this area was probably somewhat greater. The average number present in two winters (1975-76 and 1976-77) at two important wintering areas (St. Marks NWR and Chassahowitzka NWR) on this coast was about 20,000 birds (Kale 1979 ms b). In contrast, only 600 were reported on the 1975 winter waterfowl survey (Goldsberry et al. 1980).

Mississippi The Black Duck is an uncommon to common winter resident in Mississippi; it is most common in the western part of the state (Geis et al. 1971). Recent peak concentrations in winter have been of about 50-65 birds (Jackson and Weber 1977, Jackson and Cooley 1978a). Surveys of coastal areas from 1950-60 indicated average winter populations of about 5,000 birds (Geis et al. 1971); the most recent survey (January 1975) reported 400 (Goldsberry et al. 1980).


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adopted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
(NO.) Number of individuals
(+) Less than one individual
(0) None observed
BIRD NAME:
BLACK DUCK
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
JACKSON
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
DRY TORTUGAS
KEY WEST
MIAMI
PALM BEACH
MERRITT ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
FAYETTEVILLE
RALEIGH
MOREHEAD CITY
CAPE LOOKOUT
CAPE HATTERAS
974
36
28
169
202
99
29
8
12
1
0
16
6
1
0
0
9
2
+
+
2
+
12
25
1
0
1
0
0
+
4
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0
0
0
0
0
0
0
0
0
0
0
0
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 13

Black Ducks may linger until early June (Jackson and Cooley 1978a) and a few individuals may summer in the state. Burleigh (1944) noted that preferred habitat was salt water along the coast.

Alabama About a dozen pairs of Black Ducks breed at Wheeler NWR in the northern part of Alabama, but the species occurs in the state primarily as a common to abundant migrant and winter resident. Along the coast, the Black Duck has been recorded from late October through mid-April, and a pair has summered there (Imhof 1976b). Winter surveys from 1950-1960 gave an average count of some 700 birds, but the counts from the Tennessee Valley area averaged 4,000 (Geis et al. 1971). Recent winter populations at Wheeler Refuge are of about 2,500 birds but have peaked at 8,000 (Imhof 1976b). Goldsberry et al. (1980) reported 7,200 on the 1975 winter waterfowl survey.

Louisiana The Black Duck winters in Louisiana only in small numbers. Lowery (1974) noted that it arrives in early October and remains until late March. From 1950 to 1960, an average of 6,200 was seen on winter surveys in the southern portion of the state (Geis et al. 1971). Wintering populations in Louisiana have evidently declined drastically, as none were reported on the 1975 winter waterfowl survey (Goldsberry et al. 1980).

Texas Black Ducks winter in Texas from September to May and are uncommon to rare in the eastern part of the state; they were formerly more common (Oberholser 1974). Winter surveys (1950-1960) indicated an average of about 3,000 birds in the extreme northeastern part of the state (Geis et al. 1971). None were reported on the 1975 winter waterfowl survey (Goldsberry et al. 1980).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding Black Ducks breed in northeastern North America from northeastern Minnesota east to New Brunswick and Newfoundland, south to northeastern Iowa, and then east to northern Ohio and Pennsylvania and south along the coast to central North Carolina. The greatest breeding densities in Canada are in the forested areas of the Great Lakes, St. Lawrence, and Acadian areas (Reed 1968 in Bellrose 1976); in the United States these ducks breed primarily in the coastal marshes (Bellrose 1976).

Average pre-hunting season populations of the Black Duck, in 1952-1960, were estimated at 3,740,000 birds, 1,551,000 of which were adults (Geis et al. 1971). More recent information is unavailable.

Winter Black Ducks winter primarily from eastern Minnesota south to the northeastern coast of Texas, thence east to Nova Scotia and northern Florida (Geis et al. 1971, Bellrose 1976, Palmer 1976a). The January 1976 winter waterfowl survey indicated that a majority (64.5%) of the U.S. winter population of about 429,000 birds was along the Atlantic Flyway; almost all the rest wintered in the Mississippi Flyway (Larned et al. 1980). States harboring the largest wintering populations in January 1975 were New Jersey (81,910 counted), Ohio (41,000), Tennessee (34,300), and Maine (30,770) (Goldsberry et al. 1980). The total number killed in the United States during the 1975-76 hunting season was estimated to be about 361,000 birds (Larned et al. 1980).

According to the 1975 waterfowl count, 11.7% of the wintering population was found in the southeast. Among the 41,600 birds counted there, North Carolina's wintering population of 23,400 comprised by far the largest proportion (56.3%). In the remaining states, 23.3% were found in South Carolina, 17.3% in Alabama, 1.4% in Florida, 1.0% in Georgia, and 0.7% in Mississippi. None were reported on the Texas and Louisiana counts (Goldsberry et al. 1980).

Black Duck populations have been steadily declining, so much so that the species is now on the Blue List (Arbib 1979), a list that attempts to indicate species becoming threatened or endangered. Winter surveys from 1955 to 1974 showed a decline in winter populations of slightly over 40% (Bellrose 1976). The number recorded in the Atlantic Flyway during the 1975 mid-winter survey (ca. 239,000) was the lowest on record (Goldsberry et al. 1980). The reasons for this steady decrease are not adequately known but Bellrose (1976) believes it is not due to loss of breeding habitat. Recent mid-winter counts show a slight increase in numbers wintering in the Mississippi Flyway (Goldsberry et al. 1980, Larned et al. 1980).

Migration Black Ducks are less migratory than many other North American ducks, and some winter within their breeding range. The longest migrations are made by northern interior populations that may winter even farther south than the southern breeding populations (Palmer 1976a). Many postbreeding Black Ducks have a premigratory movement westward into Manitoba and eastern Saskatchewan and northward into Hudson Bay (Bellrose 1976). Bellrose (1976) considered migration corridors poorly defined, with the most important one along the Atlantic coast from the Maritime Provinces to Florida. Palmer (1976a) noted that southward departures from a given area often follow two or more clearly distinct pathways. More detailed information on migration routes may be found in Bellrose (1976) and Palmer (1976a).

HABITAT

Nesting Palmer (1976a), summarizing many authors, noted that breeding habitats and nest sites were extremely diverse, with presence of water the only characteristic in common. He also noted that this species is largely a resident of the boreal forest zone in summer.

Black Ducks nest in bogs, marshes, swamps, on grassy or woodland hillsides, on the tops of rotted stumps and in the crotches of trees in flooded areas, on rocky offshore islets, in diked hay meadows, in large cavities in old trees, in abandoned nests of other birds, along lakes and streams (Palmer 1976a), on dikes and muskrat houses, in old duck blinds, and in rock crevices (authors cited in Bellrose 1976). Palmer (1976a) also noted that they prefer to nest on high patches in dead cordgrass along the middle Atlantic coast.

Feeding Feeding habitat is usually in water deep enough for the birds to float, provided that one or more staples of diet are readily available (Palmer 1976a). These birds may be found feeding in terrestrial situations on mud flats, in stubble fields, and on upland barrens (Palmer 1976a). Bellrose (1976) noted that these birds could be found as easily in fresh, brackish, and saltwater marshes along the coast as on inland marshes, lakes, impoundments, beaver ponds, and rivers.

Winter and Offshore Black Ducks are usually found in salt-water habitats in winter. Along the Middle Atlantic coast (where most winter) they are found primarily in brackish marshes near bays and estuaries. Other habitats used in this area include a variety of freshwater areas as well as old ricefields. Along the coast to the north, the Black Duck is more strictly marine and feeds on tidal flats, salt meadows, and in floating beds of aquatic plants.

FOOD AND FEEDING BEHAVIOR

Black Ducks feed primarily by "tipping-up" in shallow waters, although on occasion they also graze (Johnsgard 1975). They may dive when foraging in deeper water (Bourget and Chapdelaine 1975) and have been known to dive as deep as 10 ft (3.0 m) (Palmer 1976a).

The diet of the Black Duck varies so much from habitat to habitat that Palmer (1976a) remarked that tables of composite diet were of limited use. He noted that one or two staples usually comprise most of the diet and that plant foods are consumed more in freshwater and brackish habitats; animal foods are more important in maritime habitats.

Detailed information on foods eaten at specific localities within the southeast is summarized by state below. For an extensive listing of foods eaten in other parts of the range see Palmer (1976a).

North Carolina Twenty-two wintering Black Ducks collected on Currituck Sound ate a wider variety of foods than the other species of ducks examined (Quay and Critcher 1965). Virtually all the food (99.8% by volume) was of vegetable origin. The most important items in the diet were the seeds and vegetative parts of smartweed (Polygonum sp. - 35.8%), the seeds of bulrush (Scirpus sp. - 13.0%), and the seeds and vegetative parts of widgeongrass (Ruppia maritima - 12.3%). Other identified foods making up more than 3% of the diet were the vegetative parts of southern naiad (Naias guadalupensis - 6.7%), wax-myrtle (Myrica - 4.1%), and spikerush (Eleocharis - 3.0%).

South Carolina Conrad (1965) reported the winter food habits of 23 Black Ducks collected in the vicinity of the lower Pee Dee and Waccamaw rivers near the coast in northeastern South Carolina. These ducks had consumed 97.6% vegetable food and 2.4% animal food; a third of the diet (by volume) consisted of swamp smartweed (Polygonum hydropiperoides). Other plant foods significant in the diet were aneilema (Aneilema keisak - 16.7%), squarestem spikerush (Eleocharis quadrangulata - 14.4%), softstem bulrush (Scirpus validus - 9.1%), the berries of arrow alum (Peltandra virginica - 6.2%), and wild rice (Zizania aquatica - 5.8%). The only animal food consumed to any extent was small fiddler crabs (2.0%). Conrad commented that the Black Duck ate more wild rice and more animal food than any of the other ducks studied.

McGilvrey (1966) reported foods eaten in November and December by 32 Black Ducks from Lake Marion, the most important inland wintering area for waterfowl in South Carolina. The diet was again largely vegetable (97.2%), with corn (Zea mays - 13.0%), seeds of sweet gum (Liquidambar styraciflua - 11.1%), and swamp smartweed (8.1%) consumed in the largest amounts. Other items making up

3% or more of the diet were green hawthorne (*Craetaegus viridis* - 7.3%), southern smartweed (*Polygonum densiflorum* - 4.3%), the seeds of buttonbush (*Cephalanthus occidentalis* - 6.4%), a sedge (*Cyperus* - 7.3%), and watergrass (*Hydrochloa carolinensis* - 5.8%).

The food habits of another 63 ducks wintering in coastal South Carolina were reported by Kerwin and Webb (1972). Again, these birds had fed largely on plants (98.4%). Of the foods identified, pickerelweed (*Pontederia cordata* - 13.1%) and northern jointed spikerush (*Eleocharis equisetoides* - 10.5%) were the most important. Other species found in significant amounts were swamp smartweed (6.1%), saltmarsh bulrush (*Scirpus robustus* - 6.0%), dotted smartweed (*Polygonum punctatum* - 5.7%), wax-myrtle (*Myrica cerifera* - 4.9%), arrowleaf tearthumb (*Polygonum sagittatum* - 4.8%), bigleaf tearthumb (*Polygonum arifolium* - 4.7%), softstem bulrush (4.0%), a flat sedge (*Cyperus odoratus* - 3.6%), and widgeongrass (3.1%).

Landers et al. (1976) reported the foods eaten by 36 Black Ducks collected during the hunting seasons in 1972-73 and 1973-74 from managed tidal impoundments. The majority of the food (93.8% vegetable) consisted of dotted smartweed (33.0%) and saltmarsh bulrush (34.1%). Only three other plants made up more than 3% of the diet: saltmarsh cockspurgrass (*Echinocloa walteri* - 8.4%), redroot (*Lachnanthes caroliniana* - 3.8%), and a flat sedge (*Cyperus polystachos* - 3.5%).

Finally, Prevost et al. (1979) reported that six Black Ducks collected during the 1976-77 hunting season in Georgetown County had fed almost entirely on saltmarsh bulrush (89.7%) and widgeongrass (10.3%).

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Black Ducks nesting at Pea Island, North Carolina, had a hatching peak in the first half of June, suggesting a peak of laying about a month earlier (Palmer 1976a). In Maryland, a short distance farther north, peak laying occurred from mid- to late April. More northern populations nest later (Bellrose 1976, Palmer 1976a), but terminate laying at about the same time.

Mean Clutch Size Summarizing many studies that total more than 1,100 nests, Bellrose (1976) placed the average clutch size at 9.3 eggs; most clutches contain between 7 and 11 eggs.

Incubation Period The incubation period varies considerably depending on ambient temperatures and the attentiveness of the hen. Averages in two studies ranged from 23 to 29 days (Bellrose 1976). Extremes of 23-33 days are given by Palmer (1976a), who noted that the mean incubation period was 26.2 days (mode 25) in Maryland, compared with a mean of 29.3 days (mode 27) for cooler Quebec.

Hatching Success Overall, nest success of the Black Duck averages about 42%. About 6% of the eggs in successful nests failed to hatch in a Maryland study (Bellrose 1976). Palmer (1976a) remarked that hatching success varies from year to year throughout the range. He reported a range of hatching success from 51.4% to 83.3% over a five-year period in Quebec.

Fledging Success There is about a 23% reduction in brood size through the period of development (Bellrose 1976), but we have no figures for fledging success as this term is usually applied.

Age at Fledging Black Ducks become capable of flight at an age of 58-63 days (Gollop and Marshall 1954 in Bellrose 1976). Palmer (1976a) reported that young birds usually fly in their 8th week.

Age at First Breeding Both males and females are capable of breeding in their first year. A large proportion of the females do so, but many males may not breed until the second year or later (Palmer 1976a). In at least one area, about 6-10% of the females did not breed in their first year; these may have been birds that hatched late the preceding summer (Stotts in Bellrose 1976).

Mortality of Eggs and Young Raccoons are the most important predator on Black Duck nests in the southern portion of the range. In other areas crows and gulls may destroy a large proportion of the nests. Tidal flooding and human activities are other sources of nest failure (Bellrose 1976). As for many other precocial birds, little quantitative information is available on the sources of mortality of Black ducklings, but the factors are probably the same as for other dabbling ducks, i.e., predation and failure to reach water.

Renesting Renesting is frequent in the Black Duck and in some areas these nesting attempts may account for a large share of the young produced (Bellrose 1976). Only rarely is a third clutch initiated after the loss of a second. Various studies have reported a range of 5-26 days between nestings after loss of a clutch. Older hens are more likely to renest than younger ones. In one study, 14% of the yearlings and 49% of older hens renested (various authors cited in Bellrose 1976).

Maximum Natural Longevity A banded bird recovered in Delaware had reached an estimated minimum age of 26 years and 5 months (Clapp et al. in press).

Weight Bellrose (1976) gave the average weights of 346 adult males and 224 adult females as about 2.76 lb (1,250 g) and 2.45 lb (1,100 g), respectively.

SUSCEPTIBILITY TO OIL POLLUTION

The Black Duck is a known victim of oiling. In the winter of 1942, oil penetrated inland along coastal New Jersey, killing hundreds of Black Ducks (Peterson 1942). Estimated mortality of Black Ducks killed in seven spills along the Delaware River and in the Chesapeake Bay, 1973-1978 was about 525 birds, or about 0.1% of all birds killed (Perry et al. 1979). No other dabbling duck except the Mallard was as strongly affected. Data from other oiling incidents are shown in Table 4.

A few experimental studies have produced information on the effects of oil on this species. Black Ducks experimentally painted with oil on the breast were shown to ingest significant amounts following preening (Hartung 1963); those experimentally fed cutting or diesel oil developed an inhibition of acetylcholinesterase activity that resulted in incoordination, ataxia, tremors, and constricted pupils (Hartung and Hunt 1966).

Black Ducks are more likely to occur on salt water than most dabbling ducks, and thus are more likely to become victims of oil spills. However, only a small proportion of the winter population occurs in coastal waters of the southeastern states. The species is most likely to be at hazard in North Carolina, where over half the Black Ducks wintering in the southeast are found and where the cooler winters will promote greater mortality from oiling.

Table 4. Number of dead birds and number and percentage of dead Black Ducks found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Black Ducks	Percentage of Black Ducks	Source
Island Beach, New Jersey	Jan. 1945	92 (a)	1	1.09	Kramer and Kramer 1945
Off eastern Canada	Feb.-Apr. 1970	1,276 (b,c)	1	0.08	Brown et al. 1973
Chesapeake Bay, Virginia	Feb. 1976	8,385 (b)	12	0.14	Roland et al. 1977

(a) Total includes some birds that were not oiled.
(b) Total includes only those birds identified to species.
(c) Total includes both live and dead oiled birds.

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NORTHERN PINTAIL

(Anas acuta)

[DA: Spidsand, DU: Pijlstaart, FI: Jouhisorsa, FR: Canard pilet, GE: Spiessente, IC: Grafond, IT: Codone, JA: Onagagamo, NW: Stjertand, PO: Rozeniec, PR: Arrabio, RU: (Awltail), SP: Pato cola-puntiaguda comun, Pato pescuecilargo, Anade rabudo; SW: Stjartand, US: Common Pintail, Sprig]

GENERAL DISTRIBUTION

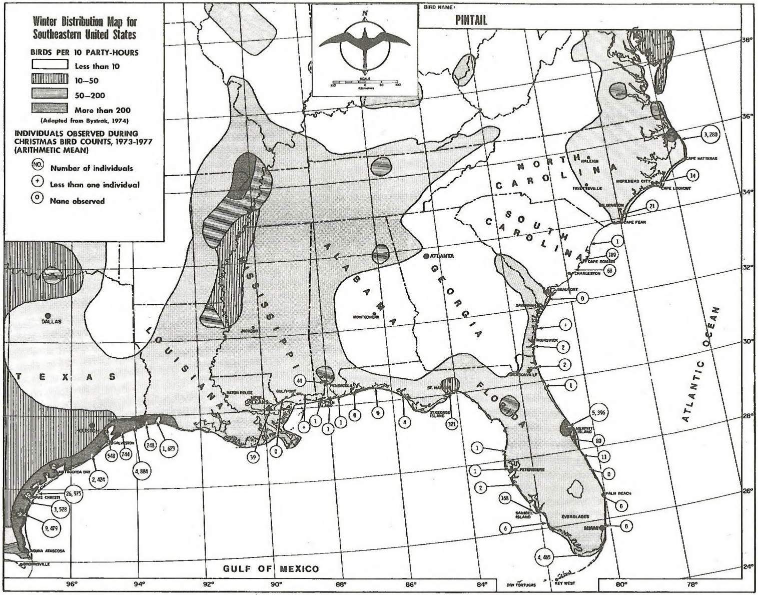
One of the most widespread of the North American waterfowl, the Northern Pintail breeds from the Aleutian Islands and Alaska east across northern Canada to the Ungava Peninsula, and south to central California, northwestern New Mexico, Kansas, Iowa, the Great Lakes, the St. Lawrence River, and Newfoundland. Isolated nesting occasionally takes place south of these general boundaries (AOU 1957, Johnsgard 1975, Palmer 1976a). The species winters from southern Alaska and coastal British Columbia through the western states, and on the Atlantic coastal plain from New York to the Gulf of Mexico, through Mexico and Central America, and in the Greater Antilles (AOU 1957, Bond 1971, Palmer 1976a). The species also breeds across most of Europe and northern Asia, wintering south to sub-Saharan Africa and south Asia (Dement'ev and Gladkov 1952, Cramp et al. 1977).

The Northern Pintail is a common winter bird in the coastal southeastern United States (Map 14). Large proportions of the birds using the Atlantic Flyway winter in North Carolina (35,000) and South Carolina (87,000), where they frequent rice fields, open ponds, and cypress lagoons (Sprunt and Chamberlain 1949, Bellrose 1976). Large numbers also winter in northern Florida (Bellrose 1976, Kale 1979 ms b). Birds from the Mississippi Flyway are concentrated in the coastal marshes of Louisiana (est. 720,000) and coastal Texas (Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

Pintails may be badly affected by oil. In inland areas of the Caspian Sea they have been the most frequent victims of oiling (Vereshchagin 1946). Others have suffered heavy mortality due to oil sumps in Wyoming (King 1953). At least one Pintail was affected by the 1971 oil spill in San Francisco Bay (Smail et al. 1972). Large numbers winter in and around the coastal marshes of the southeast, and an oiling incident affecting shallow water areas could have an impact on the North American population. However, they will probably be little affected by offshore oil production or by oil spills occurring at sea.

Taxonomic note: The AOU Check-list (1957) gives the English name of this species simply as Pintail. We prefer to call it the Northern Pintail following Johnsgard (1975) and Palmer (1976a) to reduce confusion with other species referred to as Pintails (e.g., Bahama or White-cheeked Pintail, Anas bahamensis).


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
BIRD NAME:
PINTAIL
N
SCALE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
HOUSTON
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
3,280
14
21
1
189
68
0
+
2
2
1
5,396
80
11
0
0
0
1
1
2
168
6
4,465
321
4
0
0
1
1
1
+
44
0
39
1,623
248
4,884
744
548
2,424
26,975
3,528
9,479
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 14

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BLUE-WINGED TEAL

(Anas discors)

[DA: Blavinget And, DU: Blauwvleugeltaling, FI: Sinisiipitavi, FR: Sarcell soucrourou, GR: Blauflugelente, IT: Marzaiola americana, PO: Kaczka modroskrzydia, PR: Pato, SP: Cerceta aliazul, Cerceta de alas azules; SW: Amerikansk arta]

GENERAL DISTRIBUTION

The Blue-winged Teal is a breeding bird from southeastern Alaska and British Columbia across the Prairie Provinces of Canada to southern Ontario and Nova Scotia. The range extends southward to California, the Great Basin, central Texas and Louisiana, northern Missouri, Tennessee, and the central Atlantic Seaboard (AOU 1957, Bellrose 1976). Occasional nesting takes place in the southeastern states. In winter the Blue-winged Teal occurs from southern California, northern Mexico, coastal Texas and the Gulf coast to South Carolina, south through Mexico and Central America to northern South America, occasionally as far south as Argentina and Chile (AOU 1957, Bellrose 1976, Palmer 1976a).

This teal is most common as a spring and fall migrant in the coastal southeast, although moderate numbers winter there (Map 15) and a few remain to breed. Some estimated wintering populations are 5,000 in South Carolina, 11,000 in Florida, 190,000 in Louisiana, and 8,000-9,000 in coastal Texas (Bellrose 1976). Preferred habitats are freshwater or brackish marshes and shallow inland ponds (Palmer 1976a; Johnsgard 1975, 1978).

SUSCEPTIBILITY TO OIL POLLUTION

The Blue-winged Teal rated a score of only 1 of a possible 100 on King and Sanger's (1979) Oil Vulnerability Index based on birds of the northeast Pacific, where the species is uncommon. King (1953) reported this species as a victim of oil sumps in inland localities. Although the species both nests and winters in coastal marshes in the southeastern United States, only a very small proportion of the population is involved. Many birds remain inland on fresh water, and most winter well south of the area. Danger to this species by development in the southeast would be slight.

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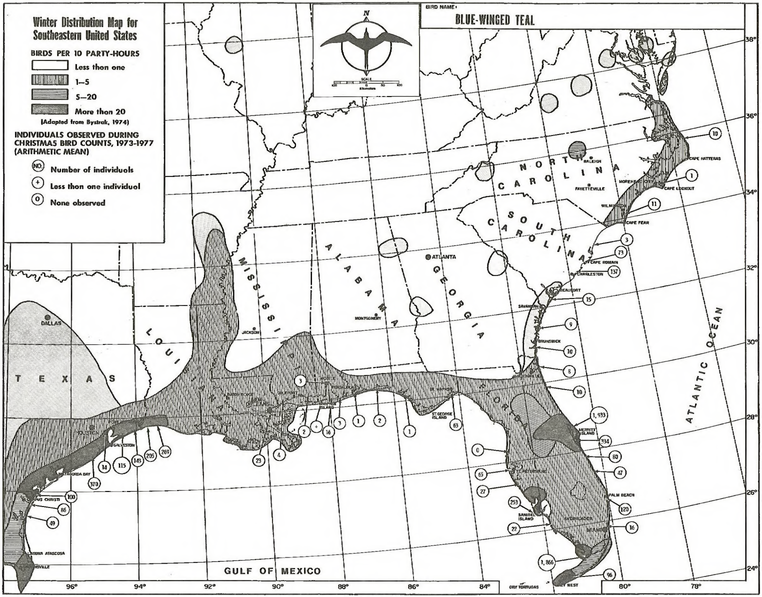
Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
100
0
50
100
Kilometers
BIRD NAME:
BLUE-WINGED TEAL
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
JACKSON
MONTGOMERY
ATLANTA
ISLAND
ST GEORGE ISLAND
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
MERRITT ISLAND
PALM BEACH
SANIBEL ISLAND
EVERGLADES
MIAMI
DRY TORTUGAS
KEY WEST
10
1
11
3
73
137
15
9
10
8
10
1,933
334
80
47
0
65
27
253
120
22
16
1,866
96
3
2
+
16
3
1
2
1
63
23
4
14
115
143
205
269
370
100
86
49
96°
94°
92°
90°
88°
86°
84°
80°
78°
38°
36°
34°
32°
30°
28°
26°
24°

Map 15

1979

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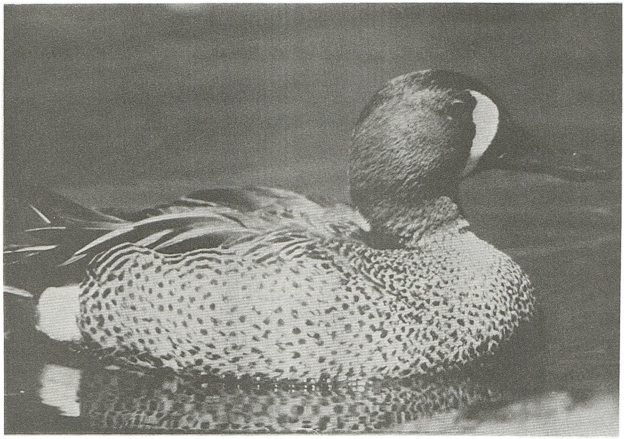

Blue-winged Teal. Photograph by Roger B. Clapp.

CINNAMON TEAL

(Anas cyanoptera)

[FR: Sarcelle cannelle, GE: Zimpente, SP: Pato colorado]

GENERAL DISTRIBUTION

The Cinnamon Teal is primarily a South American species, with one subspecies extending into North America. This subspecies breeds from southern British Columbia, Alberta, and Saskatchewan south through the Pacific coastal and inter-mountain states generally west of the Rocky Mountains, but also in the western Great Plains through western Texas to northern Mexico. In winter these birds occur in the southern portions of the western states from California to Texas, southward through Mexico and Central America to Colombia (AOU 1957; Johnsgard 1975, 1978).

Cinnamon Teal have been reported as stragglers in several eastern states and provinces, from Ontario and New York to Louisiana and Florida (AOU 1957, Palmer 1976a). There are only a few records from most of the southeastern coastal states, most of them based on observations (Map 16). Actual occurrences may be more numerous, because females of this species are not distinguishable from the more abundant Blue-winged Teal. Records accumulated from American Birds and other sources for this study indicate four records in North Carolina (1935-74), four in South Carolina (1933-1962), three in Georgia (1977-79), several older records and 14 recent ones (1961-78) from Florida (the latter representing probably no more than 12 birds), and two records from Alabama (1961-78). Lowery (1974) summarized some two dozen records from Louisiana; there are two more recent (1974-76) reports. The species occurs regularly in small numbers on migration and in winter along the southern Texas coast (Oberholser 1974, Bellrose 1976).

SUSCEPTIBILITY TO OIL POLLUTION

Cinnamon Teal rarely die from oiling; the banding office at Patuxent, Maryland, has only two records of Cinnamon Teal whose deaths were attributed to this cause. As a bird that occurs primarily on inland ponds and marshes, and of only incidental occurrence in the southeastern United States, the species is not likely to be adversely affected by development in that area.

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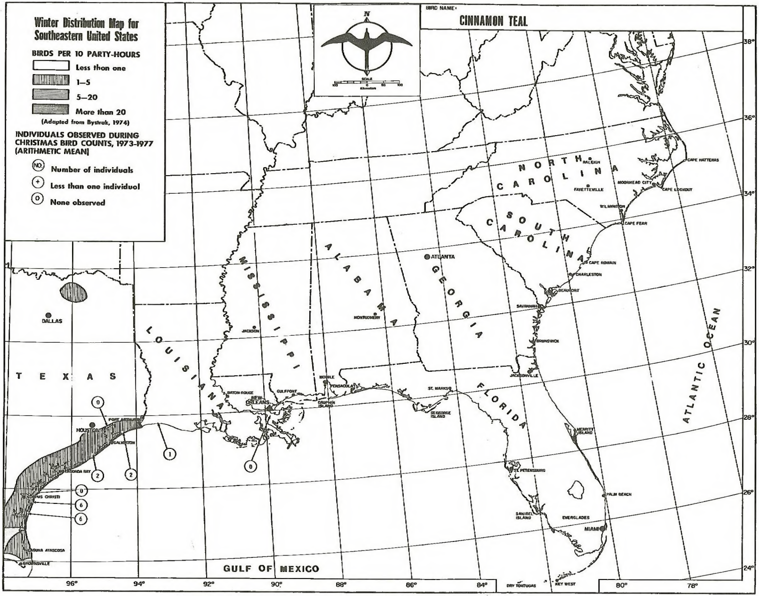
Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
CINNAMON TEAL
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
JACKSON
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
FAYETTEVILLE
RALEIGH
MOORHEAD CITY
CAPE LOOKOUT
CAPE HATTERAS
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
0
1
0
2
2
0
6
6
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 16

1979

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1918

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NORTHERN SHOVELER

(*Anas clypeata*)

[DA: Skeand, DU: Slobeend; EN: Shoveler, FI: Lapasorsa, FR: Canard souchet, Souchet ordinaire; GE: Loffelen, IC: Skeidond, IT: Mestolone, JA: Hashibirogamo, NW: Skjeand, PO: Plaskonos, PR: Pato-trombeteiro, RU: (Broad-nosed Duck), SP: Pato cuchara, Cuchareta; SW: Skedand]

GENERAL DISTRIBUTION

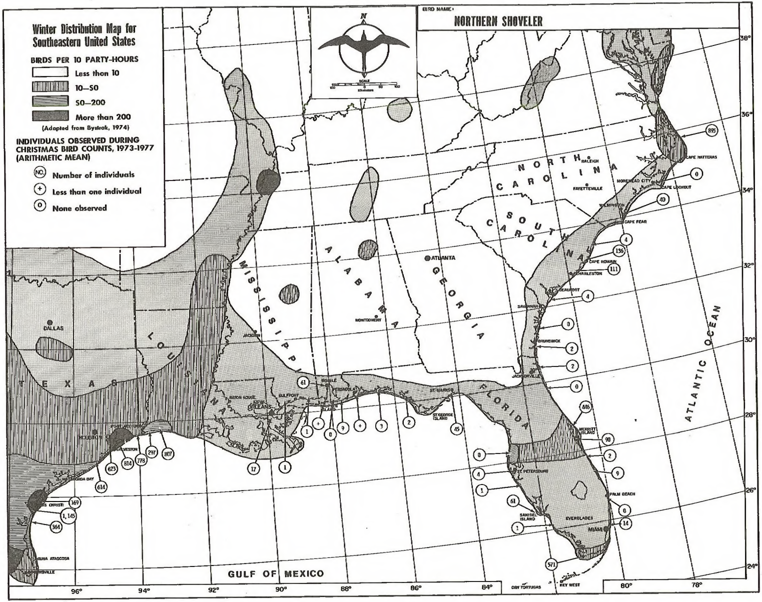
The Northern Shoveler breeds in North America in shallow open marshes from western Alaska and northwestern Mackenzie south to central California, Utah, Nebraska, and eastern Manitoba (AOU 1957, Palmer 1976a). There are many records of nesting beyond that general range that may represent former breeding populations or newly established ones. The average North American breeding population is nearly 2 million birds, centered in the mixed prairie association of the Dakotas and the Canadian Prairie Provinces (Bellrose 1976). An Old World population breeds from the British Isles across Europe to subarctic Asia (Cramp et al. 1977).

In winter the Northern Shoveler occurs along the Pacific coast, through the southern states, and along the Atlantic seaboard from Chesapeake Bay and North Carolina's Currituck Sound southward (Map 17) into Mexico and the West Indies (AOU 1957). They are locally common in the southeastern states in winter, but are more abundant in fall and spring migrations. Large southeastern wintering populations are found in Louisiana (235,000), South Carolina (15,000), and coastal Texas (Bellrose 1976). Most wintering birds prefer fresh water (Johnsgard 1975) but some are found in brackish lagoons and marshes subject to tidal influence, where aquatic invertebrates are plentiful (Stewart 1962, Palmer 1976a).

SUSCEPTIBILITY TO OIL POLLUTION

Although Northern Shovelers have seldom been reported as victims in marine oiling incidents (Joensen 1972b), they have suffered from oiling from inland oil-sumps in Wyoming (King 1953). Northern Shovelers are not birds of open marine situations, and thus would not be vulnerable to most spills. Should oil drift into shallow estuarine marsh areas, these birds might be vulnerable because of their feeding methods.

Taxonomic note: Until 1973 this species was regarded by the AOU as *Spatula clypeata*.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10—50
50—200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
N
SCALE
100 0 50 100
Kilometers
BIRD NAME:
NORTHERN SHOVELER
NORTH CAROLINA
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
SOUTH CAROLINA
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
GEORGIA
ATLANTA
BRUNSWICK
JACKSONVILLE
ALABAMA
MONTGOMERY
MISSISSIPPI
JACKSON
LOUISIANA
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
ST. MARKS
ST. GEORGE ISLAND
FLORIDA
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
TEXAS
DALLAS
HOUSTON
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
GULF OF MEXICO
ATLANTIC OCEAN
895
0
40
4
136
111
4
0
2
2
0
446
90
2
9
0
14
571
1
61
1
4
0
45
2
3
+
9
0
+
1
61
1
17
807
297
778
814
623
614
169
1,145
364
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 17

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CANVASBACK

(Aythya valisineria)

[FR: Milouin aux yeux rouges, GE: Riesentafelente, JA: O-hoshi-hajiro, SP: Pato lomo cruzada]

GENERAL DISTRIBUTION

North America The primary breeding range of the Canvasback in North America extends in the west from northwestern and central Alaska south through central and eastern British Columbia to southern British Columbia, and south from northwestern and southeastern Alberta to northeastern Montana, central South Dakota, northeastern Nebraska, and northwestern Iowa. To the east the regular breeding range includes the northern Yukon, eastern Northwest Territories, northwestern and southern Saskatchewan, and southern Manitoba south through western Minnesota (Palmer 1976b).

Outside the main breeding range Canvasbacks breed at scattered localities apparently because of destruction and drainage of requisite marsh nesting habitat (Johnsgard 1975). To the south and west they breed in Washington, southern Oregon, at Tule Lake in California, in southern Idaho, southern Nevada, northern Utah, northern Arizona, Wyoming, and northern Colorado. To the south and east breeding has been reported from Kansas, Ontario, Wisconsin, on the Montezuma marshes of New York, and at least once in Illinois (Johnsgard 1975, Bellrose 1976, Palmer 1976b).

The winter range of the Canvasback partially overlaps the breeding range and large numbers winter both inland and along the coast (Palmer 1976b). In western North America the primary winter range extends from southwestern coastal British Columbia south along the coasts of Oregon and Washington to northern Baja California and south inland from north-central California to northeastern Baja California, southeastern New Mexico, and northwestern Sonora. In eastern North America the primary wintering range east of the Appalachians extends south from Rhode Island and southern Massachusetts through Florida. To the west of the Appalachians, Canvasbacks winter from the Great Lakes south to the Gulf coast and eastern, central, and western-central Mexico, west to northeastern Kansas, central Oklahoma, southeastern Arizona, western Texas, and southwest to the Pacific coast of Mexico (Palmer 1976b). Bellrose (1976) indicated that the regular winter range in the east extends from Vermont south to Lake Okeechobee, Florida.

World Distribution Canvasbacks are native to North America and are found elsewhere only as stragglers. They have wandered to Bermuda, Cuba, the Hawaiian Islands, and Japan (Palmer 1976b).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina Pearson et al. (1942) noted that the Canvasback is chiefly a coastal species in the winter in North Carolina (Map 18). Formerly, the species was abundant and was a prized game duck. In the 1930's, populations were seriously depleted by overshooting, loss of breeding habitat, and botulism (Pearson et al. 1942, Geis 1974). As a result of hunting closures and various other measures, Canvasback numbers have increased, but not to the former abundance. The primary wintering area in North Carolina is in Currituck Sound (Bellrose 1976).

The 1975 winter waterfowl survey found 19,800 Canvasbacks in North Carolina (Goldsberry et al. 1980), making this state second only to Maryland in importance as a wintering ground along the Atlantic Coast and second only to Texas in the southeast. Recent concentrations at Pea Island NWR have numbered as many as 7,000 in late November 1975 (Teulings 1976a) and 3,475 in early December 1976 (LeGrand 1977a).

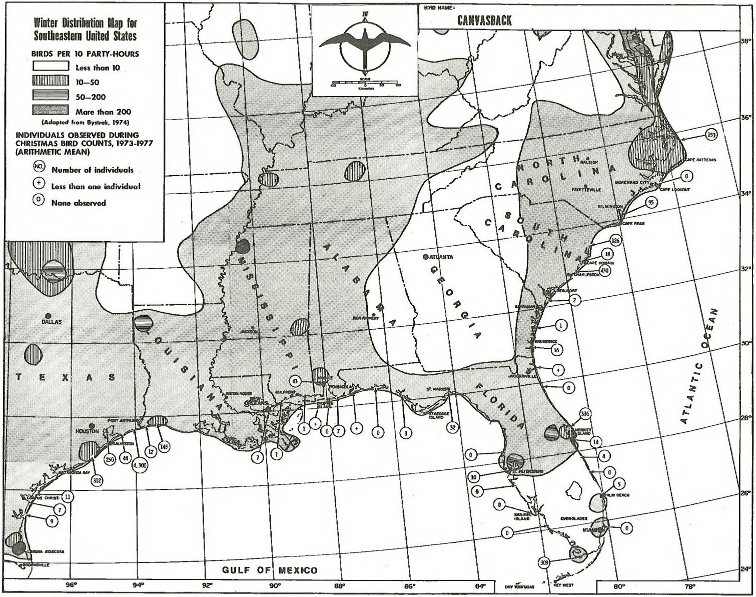
South Carolina Sprunt and Chamberlain (1949) regarded the Canvasback as a common winter resident in the state from late November to mid-April. These ducks occur in both salt and freshwater habitats; they usually feed in fresh water and move to the sea at night. At the turn of the century, these ducks were considered rare in the state. Sprunt and Chamberlain (1949), however, noted that Canvasbacks have long been regular winter visitors. Bellrose (1976) indicated a wintering population of about 3,600 birds, but only 700 were counted on the 1975 winter survey (Goldsberry et al. 1980).

Georgia Burleigh (1958) listed the Canvasback as a fairly common winter resident along the coast but uncommon and irregular in the interior of the state. Denton et al. (1977) listed dates of occurrence from November to May. Bellrose (1976) indicated that about 1,000 winter in Georgia; the January 1975 survey (Goldsberry et al. 1980) found 800 wintering there.

Florida Howell (1932) noted that these ducks are uncommon local visitors in Florida. They have been recorded from all regions, but are apparently most numerous in the northern and central portions of the state. Generally present from late October or early November, they remain until late March. Sprunt (1954) found Canvasbacks to be more common in the south-central portions of the state since Howell's time. Kale (1979 ms a, 1979 ms b) considered the Canvasback uncommon throughout the state, but he noted that large populations winter at Merritt Island and Chassahowitzka National Wildlife Refuges.

Bellrose (1976) remarked that most Canvasbacks winter inland in Florida and indicated a population of about 7,500. The 1975 winter survey found only 300 (Goldsberry et al. 1980). Another estimate for the Florida population that year indicated that 3,000 were present (Gasaway et al. 1979). Two years later, 9,500 Canvasbacks were recorded (Gasaway et al. 1979).

Alabama Imhof (1976b) regarded the Canvasback to be common in winter and on migration in Alabama, particularly along the coast. Preferred habitats in Alabama include the wide expanses of shallow waters in the Tennessee River and Mobile Bay, but Canvasbacks are also found on small ponds and lakes. They usually occur in small flocks. Along the Gulf coast they have been recorded at Cochrane Causeway from 4 October to 21 April, and a maximum of 7,600 was recorded on 7 January 1955. Imhof (1976b) noted that Canvasback numbers have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NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
BIRD NAME:
CANVASBACK
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
DAUPHIN ISLAND
PENSACOLA
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
153
0
95
126
18
430
2
1
16
+
0
336
14
4
0
5
0
0
0
10
0
0
309
43
1
+
0
7
+
0
1
32
7
1
145
12
250
44
4,300
812
11
7
9
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 18

recently declined along the Gulf coast.

Bellrose (1976) reported winter populations for the state of about 2,300, most of them on Mobile Bay; the most recent count available (1975) found only 200 birds (Goldsberry et al. 1980).

Mississippi Burleigh (1944) saw small flocks of Canvasbacks only in October and November along the Mississippi coast, but there are a few records of late migrants and summering birds for the period for April through July as well (Imhof 1973, 1975; Jackson and Cooley 1978b). Information provided by Bellrose (1976) indicated some 4,400 winter in Mississippi, mostly at Sardis Lake (inland) and on the coastal bays. More recently, mid-winter rafts of 1,600 (1977) and 1,000 (1978) have been reported at Lake Washington, in the interior portion of the state (Jackson and Weber 1977, Jackson and Cooley 1978a). The January 1975 waterfowl count found few birds in Mississippi.

Louisiana The Canvasback is a regular winter resident in Louisiana, usually arriving in the state in late October and departing during April (Lowery 1974). Bellrose (1976) reported that 15,000 winter there, most of them near Morgan City on Six Mile and Wax lakes. The 1975 winter survey reported only 1,000 birds (Goldsberry et al. 1980). The survey of Louisiana was incomplete, however, and it seems likely that a number of birds were overlooked.

Texas Oberholser (1974) noted that the Canvasback is irregularly very common on the Texas coast. It is most numerous in the northern half of the state in spring and fall. These ducks generally are seen from mid-October to early May. Bellrose (1976) indicated wintering populations of about 9,400, half inland and half on the coast. The January 1975 survey listed 25,810 (Goldsberry et al. 1980).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding Canvasbacks nest only in North America. Most breeding occurs from northwestern Alaska south to south-central British Columbia, and southeast to southern Manitoba, western Minnesota, and eastern South Dakota. The heart of the breeding range is in the southern portions of Alberta, Saskatchewan, and Manitoba. Of approximately 678,000 counted on the breeding grounds during the 1976 survey, 76% were found in these provinces (Larned et al. 1980).

In recent years there has been considerable concern about the status of the Canvasback. Numbers fluctuate widely from year to year and Bellrose (1976) considered it even more threatened than the Redhead. Declines in the population have led to restrictive hunting regulations, both in the 1930's and more recently. Poor nesting success has been attributed to high mortality rates, habitat and range reduction, and increased nest predation (Trauger 1974 in White et al. 1979). Even now this species is still on the Blue-list (Arbib 1979), a list that attempts to indicate species whose populations have declined so seriously that they may become threatened or endangered. Johnsgard (1978) remarked that unbalanced sex ratios, declining breeding habitat, sensitivity to oil and other pollutants on the wintering grounds, and vulnerability to hunting make the future of the Canvasback most uncertain.

Winter Wintering Canvasbacks are found primarily along the Atlantic, Pacific, and Gulf coasts of the United States and Mexico, but substantial numbers also winter inland. The Chesapeake Bay is the largest wintering ground, harboring some 92,000 birds; the next largest concentration, 60,000 birds, winters in San Francisco Bay (Bellrose 1976). Bellrose (1976) summarized winter waterfowl surveys for 1960-1971 and indicated that about half the average North American winter population of 290,000 wintered along the Atlantic Flyway, most of them just north of North Carolina. The figures provided by Bellrose show that the southeastern states are an important wintering ground for the Canvasback. Twenty percent of the total winter population is found there; 26% of these occurred in North Carolina, 6% in South Carolina, a few in Georgia, 13% in Florida, 4% in Alabama, 8% in Mississippi, 26% in Louisiana, and 16% in Texas.

Figures provided by the 1975 winter waterfowl survey (Goldsberry et al. 1980) suggest a somewhat different distribution that can probably be attributed both to annual variation in wintering areas and to incomplete coverage by the survey. Approximately 291,000 birds were found on the January survey, about 17% (48,610) of which were in the southeast. North Carolina accounted for 41% of the Canvasbacks occurring in southeastern waters, and Texas harbored another 53%. No other state reported more than 1,000 birds.

Migration Bellrose (1976) summarized migratory pathways of the Canvasback, noting that most Canvasbacks move toward either the Atlantic or Pacific coasts from their breeding grounds and staging areas. Those migrating toward the Chesapeake Bay move from southeastern Saskatchewan southeast and then east along two paths, one through the Great Lakes area and then to the southeast, and the other from the Mississipi River between Fort Madison and Keokuk due east. Most of the Canvasbacks arriving in the Chesapeake Bay winter there, but a substantial number move south to Currituck Sound in North Carolina. Relatively few continue on south to Florida (Bellrose 1976).

Other birds from the Fort Madison/Keokuk area move directly south and southeast to Louisiana, Alabama, and Florida. Most of the birds wintering in Texas migrate directly south (Bellrose 1976).

HABITAT

Nesting Canvasbacks nest in small, shallow ponds usually less than an acre in size and bordered by cattails, bulrushes, and other emergent vegetation. Most of their feeding, resting, and courting takes place on larger, deeper, permanent ponds (Trauger and Stoudt 1974 in Bellrose 1976). Others may breed in village ponds, farmyard sloughs, large marshes, and potholes (Bellrose 1976, Palmer 1976b). Nests are usually built over water, occasionally on muskrat (Ondatra zibethica) houses and seldom on dry land (Palmer 1976b). Authors cited in Bellrose (1976) indicated that cattails are most used for nest sites in prairie potholes and that willows, bulrush, sedges, and phragmites cane are extensively used in other areas.

Feeding Most feeding on the breeding grounds occurs near the nesting areas on larger, more permanent ponds than those used for nesting (Trauger and Stoudt 1974 in Bellrose 1976). Those nesting in a prairie pothole region in southern

Manitoba tended to forage in open water near the center of ponds (Siegfried 1976b). Young birds usually feed on well-vegetated ponds intermediate in size between those used for nesting and those used for resting (Trauger and Stoudt 1974 in Bellrose 1976). In addition, they often feed on open water far from the nest site (Palmer 1976b). Migrants gather on large freshwater lakes and marshes where aquatic plants are abundant (Johnsgard 1978).

Winter and Offshore Johnsgard (1978) reported that preferred winter habitat consisted of brackish estuarine bays rather than either salt or fresh water. Palmer (1976b) noted that Canvasbacks regularly feed in shallow water after flying in from roosting areas on open bays and lakes. These roosting areas are usually well offshore, but Canvasbacks may come to shore when encountering heavy winds.

FOOD AND FEEDING BEHAVIOR

Canvasbacks dive for food using their feet for propulsion; they feed mostly in the early morning and evening. In deeper water they dive for periods of 10-20 sec (Palmer 1976b). When diving, both this species and the Redhead lift up the front of their body, arch their necks, and submerge vertically; they subsequently rise to the water's surface near where they dove (Siegfried 1976b). Siegfried (1976b) recorded mean diving times of 17.6 and 15.6 sec for males and females, respectively, foraging on ponds in Manitoba. At coastal impoundments in South Carolina, mean diving times varied from 13.1 to 15.3 sec in relation to the depth of the water; there was no significant difference in diving times between the sexes (Alexander and Hair 1979). Foraging rates (dives per 5 minutes) in the impoundments varied with depth of water and ranged from 1.7 to 10.0. Alexander and Hair (1979) noted that the Canvasbacks established and defended individual foraging sites.

In very shallow water this duck will also "puddle" with its feet and then dip its bill to feed. Canvasbacks also seize insects from the water's surface and from the air (Palmer 1976b).

Summaries of Canvasback food habits by Bartonek and Hickey (1969a), Bellrose (1976), and Palmer (1976b) indicate that these ducks primarily feed on plants but are not averse to feeding on animals. The extent to which plants are utilized may vary considerably. Authors cited in Palmer (1976b) indicated a consumption of 65% plant matter in Illinois, 74% at Reelfoot Lake in Tennessee, 95% in Missouri, and 80% over a large portion of the range.

Pondweeds (Potamogeton spp.), wild celery (Vallisneria spiralis), and widgeongrass (Ruppia maritima) are among the more important plant foods. Bartonek and Hickey (1969a) believed that Potamogeton may be more important in the diet than Vallisneria because the former occurs more widely within the range of the Canvasback (this duck's specific name is derived from a supposed predilection for Vallisneria). Animal foods consist largely of various molluscs and aquatic insects; crustaceans and fish may also be taken. Caddisfly larvae and cases and midge (Chironomidae) larvae are among the insects frequently reported.

Some Canvasbacks on the breeding grounds eat a much higher proportion of animal matter than is suggested by the studies indicated above. Bartonek and Hickey (1969a) reported that esophogeal contents of juveniles and adult females in Manitoba were 87% and 92% animal matter, respectively. Adult males had consumed only 2% animal matter. Their principal food was tubers of Potamogeton (95%).

Food habits in the southeast have been little studied, and we have found but one detailed report on food habits in this area. Quay and Critcher (1965) reported foods eaten by 62 Canvasbacks collected in Currituck Sound during winters from 1947 to 1952. They found that the Canvasbacks had subsisted almost entirely on vegetable matter, primarily the vegetative parts of pondweeds (Potamogeton spp. - 21.0% by volume) and their seeds (38.2%). The vegetative parts and seeds of widgeongrass (12.3%) and southern naiad (Najas guadalupensis - 4.6%) were also important. No other identified plant material formed as much as two percent of the diet.

In both South Carolina and Georgia, banana waterlily (Nymphaea mexicana) was a preferred food item (Cely 1980b). At Merritt Island NWR, Florida, where this plant occurred but was unavailable to Canvasbacks, these ducks fed largely on widgeongrass, muskgrass, manateegrass (Syringodium filigormis), and invertebrates (Cely 1980b). McAtee reported that this plant was found in over 70% of the Canvasbacks collected at Lake Surprise, Texas, but at Laguna Atascosa NWR, where this plant did not occur, Canvasbacks fed primarily on widgeongrass (Cely 1980b). In Louisiana Canvasbacks eat acorns (Lowery 1931 in Palmer 1976b); tubers of delta duck potato (Sagittaria platyphylla) were reported as an important food in the Mississippi Delta (McAtee 1917 in Bartonek and Hickey 1969a, Palmer 1976b).

Bartonek and Hickey (1969a), Palmer (1976b), and Bellrose (1976) give further information on foods eaten in other portions of the range.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Throughout its range, the Canvasback begins nesting at about the same time, late April to mid-May. Nest initiation peaks around 10-25 May in the heart of the range (Bellrose 1976).

Mean Clutch Size Redheads (Aythya americana) frequently parasitize nests of Canvasbacks, which depresses the number of eggs laid by the host species. In studies involving more than 500 nests, both parasitized and unparasitized, the average clutch size for Canvasbacks was 7.9 eggs. In nests that are not parasitized, the average is about 9.5 eggs with a range of about 7 to 12 (Bellrose 1976).

Incubation Period Incubation takes 24-29 days (mean = 25)(Erickson 1948a).

Hatching Success Nesting success varies dramatically from year to year and place to place. In studies totalling 1,715 nests, 46.2% were successful in producing young. Reports cited in Bellrose (1976) indicate that eggs may hatch in as few as 2.7% of the nests in poor years. About 7.3 eggs hatch in the average unparasitized nest, but only 6.0 hatch in parasitized ones (Bellrose 1976).

Fledging Success Survival to fledging of the young in a brood is approximately 75%, or about 5.3 young per brood. The overall annual production is about 1 young bird per adult (Bellrose 1976).

Age at Fledging Flight is first achieved at 54 to 84 days; Palmer (1976b) believed that most first fly when 60-70 days old.

Age at First Breeding Most Canvasbacks breed in the first year, except when habitat conditions are adverse (Bellrose 1976).

Mortality of Eggs and Young Raccoons are major predators of Canvasback nests, particularly with their increasing abundance in the prairie pothole country. Skunks, crows, magpies, and ravens also prey on Canvasback nests. Many female Canvasbacks desert nests because of flooding or intrusion by parasitic Redheads (Bellrose 1976).

Renesting There is a considerable amount of renesting by hens that lose clutches, the proportion depending on a variety of extrinsic factors (Bellrose 1976).

Maximum Natural Longevity A bird banded and recovered in New York attained a minimum age of 18 years and 9 months (Clapp et al. in press).

Weight Bellrose (1976) gave the average weight of 191 males as 2.76 lb (1,250 g) and of 54 adult females as 2.55 lb (1,160 g).

SUSCEPTIBILITY TO OIL POLLUTION

Canvasbacks are known to be victims of oiling. In one month in 1948, an estimated 10,000 wintering ducks (mostly Canvasbacks) died following an oil and yellow phosphorous spill in the lower Detroit River in Michigan (Miller and Whitlock 1948). Most of these ducks froze to death when their natural insulation was destroyed by the oil. Eight Canvasbacks were killed by an oil spill in San Francisco Bay, California, in January 1971 (Smail et al. 1972). Mortality following seven oil spills (1973-78) in the Chesapeake Bay and on the lower Delaware River amounted to 815 birds (Perry et al. 1979). Stout and Cornwell (1976) reported that 20% of bands recovered from oiled waterfowl were Canvasbacks, a figure second only to that attained by scaup (*Aythya* spp.).

Most of the Atlantic Canvasback population winters in bays and rivers along the coast north of North Carolina or on large bodies of water inland. However, the Canvasback is frequently found in large rafts in open water offshore. In such locations an oiling incident could affect many individuals, particularly since one of the two largest concentrations in the southeast is found in Currituck Sound where colder waters would magnify the effects of oiling. In a species already subject to population fluctuations, accidental oiling could have a significant impact.

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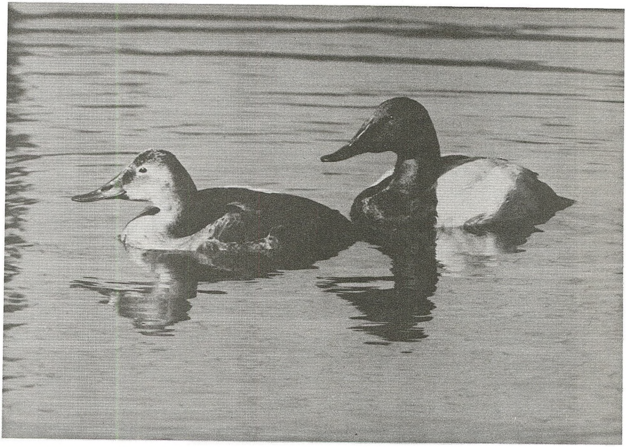


Canvasback Duck. Photograph by Northern Prairie Wildlife Research Center, U.S. Fish and Wildlife Service.

REDHEAD

(*Aythya americana*)

[FR: Milouin americain, GE: Rotkopfente, SP: Cabeza roja]

GENERAL DISTRIBUTION

North America Redheads breed in North America from central British Columbia, northern Alberta, southern Mackenzie, southern Saskatchewan, southern Manitoba, and northwestern Minnesota south through central and eastern Washington and Oregon to central California (Small 1974), northwestern Nevada, north-central Arizona, southern Colorado, central Nebraska, northwestern Iowa, and less commonly in Wisconsin, Michigan, and the Lake Erie marshes to northwestern Pennsylvania and western New York (Bellrose 1976, Palmer 1976b). Since the late 1950's, the Redhead has expanded its breeding range to Alaska and several southern and eastern states and provinces, including Maine and New Brunswick (Weller 1964). It has been introduced into New York (Benson and Browne 1969) and isolated breeding records have been reported in Kansas (Palmer 1976b), Texas (Rhodes 1979), and Jalisco, Mexico (Williams 1975).

In the winter, Redheads occur from southern British Columbia, Idaho, southwestern Wyoming, southwestern Colorado, northern Texas, southern Arkansas, southern Illinois, the Great Lakes, central New York, and Connecticut south through the United States and Mexico. They reach their southern limits in Guatemala and on islands in the Caribbean (AOU 1957, Weller 1964, Bond 1971, Bellrose 1976, Palmer 1976b).

World Distribution The Redhead breeds exclusively in North America; it occurs casually in Bermuda (AOU 1957, Palmer 1976b), and has straggled to Hawaii (Berger 1972), Greenland, the New Siberian Archipelago (Palmer 1976b), and Sweden (Bauer et al. 1980).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina The Redhead is a common winter resident in North Carolina. It is found chiefly on the salt and brackish waters of the coast, and rarely inland (Pearson et al. 1942). Bellrose (1976) noted a concentration of 6,000 in Currituck and Albemarle sounds, and Potter et al. (1980) remarked that it is fairly common in most years in Core and Pamlico sounds. The January 1975 winter waterfowl survey recorded 6,700 birds (Goldsberry et al. 1980), making North Carolina the third most important wintering ground for Redheads along the Atlantic coast (behind Rhode Island and Florida). At Pea Island NWR, 7,000 were counted in late November 1975 (Teulings 1976a) and 3,000 were there in December 1976 (Teulings 1976b, LeGrand 1977a).

South Carolina Sprunt and Chamberlain (1949) considered the Redhead an uncommon and erratic winter visitor throughout the state, occurring most frequently in coastal areas. Single birds are most commonly seen, although pairs or small groups may also be observed. The species is much less common here than in North Carolina and only a very few birds were seen on the 1975 waterfowl survey (Goldsberry et al. 1980). Redheads are generally present in the state from late October to late March (Sprunt and Chamberlain 1949).

Georgia Denton et al. (1977) regarded the Redhead as an uncommon winter resident on the coast; it is a rare winter resident inland. Data given by Bellrose (1976) from winter waterfowl surveys support this status. Dates of occurrence are from 28 October (LeGrand 1979a) to 29 April (Denton et al. 1977). Usually only small flocks or individuals are seen, in fresh or salt water (Burleigh 1958).

Florida The Redhead is locally abundant as a winter resident in Florida. The Gulf coast of Florida harbors the second largest wintering population in the United States. The January 1975 waterfowl survey recorded 91,000 birds for the state (Goldsberry et al. 1980); it should be remembered that these counts often underestimate the actual number present.

Florida - Atlantic Coast Sprunt (1954) considered the Redhead an uncommon winter visitor in northern Florida, perhaps more abundant in former times. However, he reported it as far south as the Lake Okeechobee area. Kale (1979 ms a) considered it uncommon on most of the coast but abundant at Merritt Island NWR, where 1,000 to 16,000 birds winter. Bellrose (1976) indicated that Cape Canaveral had the second largest concentration (15,000 birds) along the Atlantic coast.

Florida - Gulf Coast St. Marks NWR is the most important wintering area of the Redhead in this part of Florida. This species is the most abundant wintering duck on the refuge, but it is uncommon elsewhere and rare south of Tampa Bay (Kale 1979 ms b). Redheads occur in Florida from early November to (exceptionally) late June and July (Howell 1932; Sprunt 1954; Ogden 1970, 1973); exceptionally early birds have been seen on 26 September (St. Marks Light) (Edscorn 1979).

Bellrose (1976) gave figures of 15,000 wintering in the Florida panhandle, and 50,000 at Apalachee Bay. An unusually large concentration of 56,000 birds was seen along the coast west of Gainesville in January 1975 (Goldsberry et al. 1980), and about 60,000 were seen near St. Marks Light on 21 November 1978 (Edscorn 1979).

Alabama Imhof (1976b) noted that Redheads are uncommon in winter and on migration in most of the state, but may be locally abundant on the Gulf coast. These ducks are found on deep lakes, rivers, and bays in fresh, brackish, and salt water. Along the Gulf coast, Redheads have been recorded from 26 September to 19 May; a maximum concentration of 3,000 was reported from Mississippi Sound, 19 January 1956 (Imhof 1976b). Bellrose (1976) reported an average of 700 Redheads wintering in Mobile Bay; the 1975 winter survey reported 200 (Goldsberry et al. 1980).

Mississippi Burleigh (1944) had few records of Redheads from coastal Mississippi, and these were mostly of single birds. Dates of occurrence were from mid-October to mid-March. Bellrose (1976) reported up to 20,000 off the western Mississippi and eastern Louisiana coasts. Judging from the 1975 waterfowl survey (Goldsberry et al. 1980), most of these birds occurred in Louisiana waters. Hamilton (1978) considered a concentration of 500 near Horn Island in January 1978 unusually large.

Louisiana Lowery (1974) stated that Redheads are uncommon winter residents on inland lakes, but are occasionally observed forming rafts of several thousand on the coast. Arriving in the state around the first week of October, they remain until late April. Large numbers may winter along the eastern coast (Bellrose 1976). An incomplete survey in January 1975 found 1,000 Redheads in Louisiana (Goldsberry et. al. 1980).

Texas From mid-October to mid-May, Redheads are locally abundant to common on the lower and central coasts, and irregularly common to uncommon elsewhere in the state (Oberholser 1974). During the spring and fall, they are most numerous in the northern two-thirds of the state. Bellrose (1976) considered both the south Texas coast and that of adjacent Mexico important wintering areas for this species. Large concentrations were found at the Laguna Madre of Texas (300,000) and Mexico (60,000), and at Matagorda and San Antonio bays (20,000). Goldsberry et al. (1980) reported that 438,290 were found on the January 1975 waterfowl survey. This figure represents 62.4% of all wintering Redheads counted in the contiguous United States and Mexico, making Texas by far the most important wintering ground for the species.

Sporadic nesting by a very few Redheads has been reported from inland Castro, Medina, and Lubbock counties. These records consisted of unfledged young seen in the months of August (3 of 5 records), November, and December (Oberholser 1974, Rhodes 1979).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding Redheads breed solely in North America, most of them in an area extending from southern Mackenzie and central and southern British Columbia southeast to western Minnestota, northern Nebraska, and central Colorado, and southwest to northwestern Nevada and central California (Small 1974, Palmer 1976b).

Breeding populations on the principal prairie breeding grounds ranged from 387,000 in 1963 to 927,000 during the period 1955-74, and averaged 649,000 (Bellrose 1976). The 1976 waterfowl breeding ground survey indicated a breeding population of at least 963,000 birds, the majority (67.3%) in southern Alberta and southern Saskatchewan (Larned et al. 1980). This survey evidently did not cover several states in which the Redhead is known to breed. Among these is Utah, which contains the greatest concentration of nesting Redheads in North America in the marshes near Great Salt Lake. According to figures provided by Bellrose (1976), this area has more breeding Redheads (130,000) than all of the rest of the western United States put together.

Weller (1964) mapped densities throughout the breeding range of the Redhead, finding that extreme drought in the primary nesting range of both the Redhead and the Canvasback severely reduced the quantity and quality of breeding habitat from 1958 to 1963; low production rates caused population declines.

Winter Redheads winter from southern British Columbia in the west and southern New York in the east to southern Mexico and Guatemala and the Gulf Coast States (Map 19), with a few in the Caribbean (Palmer 1976b). However, a substantial majority of the winter population is found along the western Gulf coast in Texas and Mexico. Texas and the east coast of Mexico combined held 77.8% of the approximately 703,000 Redheads counted on the January 1975 winter waterfowl survey (Goldsberry et al. 1980). During the 1976 survey, approximately 718,000 birds were found (Larned et al. 1980).

The next largest wintering concentration (ca. 50,000 birds) occurs in Apalachee Bay on the Gulf coast of Florida (Palmer 1976b). Smaller, but also important, concentrations occur in North Carolina and on the north-central Atlantic coast of Florida (Map 19).

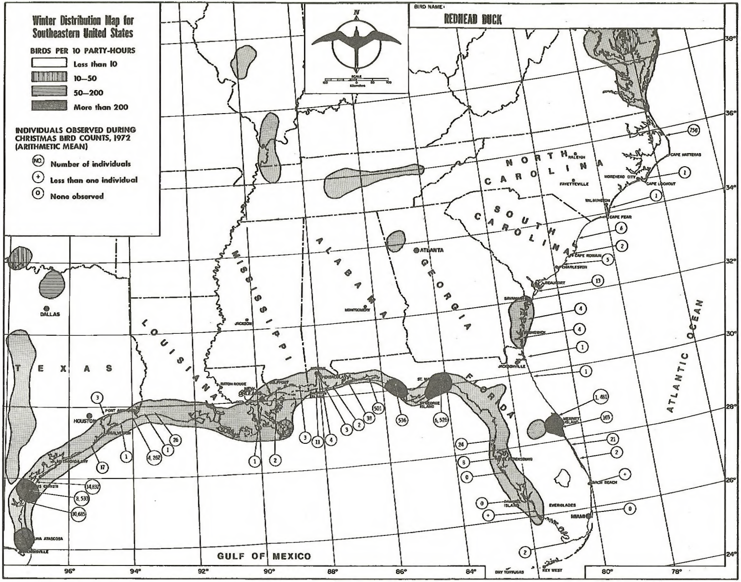
Migration The principal migration corridors are overland from breeding grounds in Idaho, Alberta, Saskatchewan, and Manitoba to the southern Gulf coast of Texas and Mexico. Most of the Pacific coast wintering birds originate in the west. Some birds from the northern prairies move eastward to the Great Lakes and south to Chesapeake Bay or the Gulf coast of Florida. Migration is discussed in detail by Lincoln (1934), Weller (1964) and Bellrose (1976).

HABITAT

Nesting The Redhead nests in dense stands of plants, preferring bulrushes, cattails, or sedges on and around marshes and potholes of the prairies and parklands. Redheads prefer extensive marshes with shallow water openings (Palmer 1976b); hardstem bulrush (*Scirpus acutus*) is the preferred nesting cover over much of the range (Bellrose 1976, Palmer 1976b). Nest sites are usually over water, but some are on islands or on land near water (Bellrose 1976).

Feeding Redheads feed more in shallow marshes and ponds than do many of the diving ducks (Bellrose 1976). During migration they are often found on shallow, slow-moving rivers and lakes (Palmer 1976b), and on fresh and slightly brackish estuarine bays with much submerged aquatic vegetation (Johnsgard 1975).

Winter and Offshore Redheads winter primarily on either saline waters that are rich in plant foods, such as coastal bays and lagoons, or large inland lakes and reservoirs (Palmer 1976b). Weller (*in* Johnsgard 1975) indicated that winter habitat was typically well protected, fairly shallow, brackish or highly saline waters along the coast. Migrants and wintering birds are often found in compact rafts (Palmer 1976b) that may contain large numbers of birds. Rafts in Florida contain from 5,000 to 20,000 ducks; as many as 80,000-90,000 have been observed off Cedar Key, usually 5-15 mi (8-24 km) offshore. A raft in Texas held some 76,000 birds. During windy weather on the lower Laguna Madre, these birds may congregate in water so shallow they barely float (Palmer 1976b and authors cited therein). Redheads wintering in the lower Laguna Madre clearly preferred areas of shallow water over hard sand vegetated solely with shoalgrass (*Halodule beaudetti*). Areas with more luxuriant stands of shoalgrass in deeper (1-2 m = 3.3-6.6 ft) water were rarely visited (Cornelius 1977).


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1972 (ARITHMETIC MEAN)
NO.
Number of individuals
+
Less than one individual
0
None observed
BIRD NAME:
REDHEAD DUCK
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
PENSACOLA
JACKSON
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
CAPE LOOKOUT
MOREHEAD CITY
CAPE HATTERAS
RALEIGH
FAYETTEVILLE
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
DRY TORTUGAS
KEY WEST
3
17
1
4,262
1
26
14,837
8,533
10,685
1
2
3
11
4
3
2
38
501
536
6,526
24
8
0
0
+
2
0
+
2
21
103
1,481
1
1
4
4
13
5
2
6
1
1
750
96°
94°
92°
90°
88°
86°
84°
80°
78°
24°
26°
28°
30°
32°
34°
36°
38°

Map 19

FOOD AND FEEDING BEHAVIOR

Redheads feed in marshes, sloughs, and ponds that are often only a meter or so deep. When in deeper waters they dive for food, but in the shallows they either "tip-up" or forage from the surface (Bellrose 1976). Alexander and Hair (1979) reported some elements of foraging behavior on coastal impoundments in South Carolina. Redheads usually foraged in small groups of 4-6 birds. At Huntington Beach, they dove for an average of 15 sec and moved underwater an average of about three body lengths. The mean foraging rate (defined as the number of dives or tip-ups per 5-minute interval) varied from 4.2 at one locality to 13.9 at another; no difference in foraging rate between the sexes was noted.

Redheads feed largely on vegetable food; studies cited by Palmer (1976b) and Bellrose (1976) indicated that between 78% and 94% of the diet may consist of plant material in transient and wintering areas. On the breeding grounds in Manitoba, however, Redheads ate considerably more animal food (Bartonek and Hickey 1969a). The principal animal food consumed in this area was the larvae of caddisflies (Trichoptera).

We give below a state-by-state summary of the principal foods eaten in the southeast; more detailed information on specific foods consumed in other parts of the range may be found in Palmer (1976b) and Bellrose (1976).

North Carolina The food eaten by 44 Redheads wintering in Currituck Sound was similar to that ingested by Canvasbacks in the same area but incorporated a larger proportion of southern naiad (Najas guadalupensis) and a smaller proportion of pondweed (Potamogeton spp.)(Quay and Critcher 1965). Pondweeds accounted for 41.1% (by volume) of the food, southern naiad 21.9%, and widgeongrass (Ruppia maritima), 12.9%. These three plant genera made up about 76% of the food identified. Unidentified animals and plants made up 2.2% and 19.0%, respectively, of the total material examined.

Florida Stieglitz (1967) reported the foods consumed by 10 Redheads wintering at Apalachee Bay, St. Marks NWR, on the Florida Gulf coast. Shoalgrass (Diplanthera wrightii) was the principal food eaten, making up 85.3% of the diet; the only other plant eaten was manateegrass (Cymodocea manatorum - 0.7%), and it was found in only one Redhead. The rest of the food consisted of molluscs, principally Olivella mutica (9.2%), Prunum apicinum (2.0%), Nassarius ambiguus (1.0%), and Anachis avara (1.0%).

Texas McMahan (1970) reported on the foods of 104 Redheads collected from November through December on the Lower Laguna Madre. As in Florida, shoalgrass was the principal food eaten and comprised almost an identical proportion of the diet (84.2%). Widgeongrass (9.8%) was the only other plant eaten. Animal food consisted of snails (2.0%) and clams (0.1%). McMahan pointed out that many of the snails were fossils that presumably had been picked up for grit and suggested that Redheads probably fed to a greater extent on widgeongrass than was indicated by his analysis of stomach contents.

During the winter of 1974-75, Cornelius (1977) conducted another study of the food habits of Redheads on the Lower Laguna Madre, following a decreased use of this wintering area. Rhizomes of shoalgrass (Halodule beaudettei) accounted for 71% of the diet of 19 Redheads; three molluscs, Anachis avara, Neritina virginea, and Cerithidea pliculosa were the animal foods eaten most often, but they comprised only 9.5% of the diet.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying The Redhead is noted for the practice of laying eggs in nests of other birds, either of its own or of other species (Weller 1959). In Iowa in 1938, the peak of the nest-building and egg-laying period was 19-25 June, when one-third of the observed nests were constructed (Low 1940). In Alberta, the mean date of nest initiation over a five-year study period was between 7 and 26 May (Keith 1961). Nests were begun in late April or early May in Montana, with first nest establishment completed by 10 June (Lokemoen 1966).

Mean Clutch Size The parasitic or semiparasitic habits of the Redhead make determination of clutch size somewhat difficult (Weller 1959). Laying by several females in one nest has resulted in "clutches" of as many as 87 eggs (Weller 1959). Various studies (cited in Bellrose 1976 and Palmer 1976b) have reported average clutch sizes varying from 8.9 to 13.5 eggs, and Bellrose reported an overall average of 11.1. Weller (1959) reported that unparasitized clutches contained from 5 to 9 eggs in studies conducted at Delta Marsh, Manitoba, and Knudtson Marsh, Utah. The average clutch size was 7.4 (n = 17). Weller also reported that parasitic females laid an average of 10.8 eggs. Palmer (1976b) believed that the true clutch size was 9 eggs in most instances.

Incubation Period Incubation periods in studies cited by Palmer (1976b) and Bellrose (1976) range from 23-29 days. Palmer (1976b) stated that the incubation period is usually 24 days.

Hatching Success In a two-year study in western Montana, Lokemoen (1966) found that eggs hatched in 15.2% of 138 clutches. However, only 9.9% of the eggs in these clutches hatched. Hatching success was greater than nest success because some nests lost eggs by interference from other birds or contained late eggs laid by parasites. In a summary of studies, Bellrose (1976) noted overall that some eggs hatched in 52% of the nests observed, but that an unusually large number of unhatched eggs were left in successful nests.

Fledging Success No precise data are available. Bellrose (1976) calculated that the production of young per hen may vary from 1.3 to 2.7.

Age at Fledging Palmer (1976b) reported that most young fly at 60-65 days and noted that a range of 56-84 days had been reported.

Age at First Breeding Female Redheads may breed as yearlings, but the proportion that do so is unknown (Bellrose 1976).

Mortality of Eggs and Young Many nests in which eggs fail to hatch were deserted because of the intrusion of parasitic females. This is prevalent enough that it led Bellrose (1976) to remark "The redhead appears to be its own worst enemy". Mammalian (skunks and racoons) and avian (crows, magpies, and gulls) predators account for a large proportion of destroyed nests, and many others are flooded by sudden increases in water level. Nests may also be deserted in time of drought or low water (Bellrose 1976).

Renesting Alliston (1979b) first documented renesting in Redheads. He found that 86.4% of 22 females whose clutches were removed later renested. Clutch size in first nests averaged 10.5 (n = 8), versus 10.3 for second nests, a statistically insignificant difference.

Maximum Natural Longevity A bird banded in Maryland after its second year was recovered in Michigan at a minimum age of 21 years and 5 months (Clapp et al. in press).

Weight Males (n = 1,157) in spring migration averaged 1,100 g (2.43 lb) and females (n = 485) averaged 990 g (2.18 lb). Thirty-two summer males averaged 940 g (2.07 lb) and 71 females averaged 900 g (1.98 lb). During fall migration, 40 males had a mean weight of 990 g (2.18 lb) and 52 females averaged 900 g (1.98 lb) (Weller 1957 in Palmer 1976b).

SUSCEPTIBILITY TO OIL POLLUTION

At least five Redheads were included among more than 8,400 birds killed by an oil spill in Chesapeake Bay (Roland et al. 1977). A very large proportion of the entire species population winters in the southeast, often in large aggregations in habitats susceptible to oiling. This duck also belongs to a group of diving ducks (*Aythya*) whose feeding habits make them especially vulnerable to the effects of oil. Consequently, we regard this species as one potentially at high risk from oil pollution in the southeast.

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Redhead Duck. Photograph by Northern Prairie Wildlife Research Center, U.S. Fish and Wildlife Service.

RING-NECKED DUCK

(Aythya collaris)

[FR: Morillon a collier, GE: Halsringente, NW: Ringand, Halsringand, SP: Pato de collar, Pato negro, Pato del medio cavezon]

GENERAL DISTRIBUTION

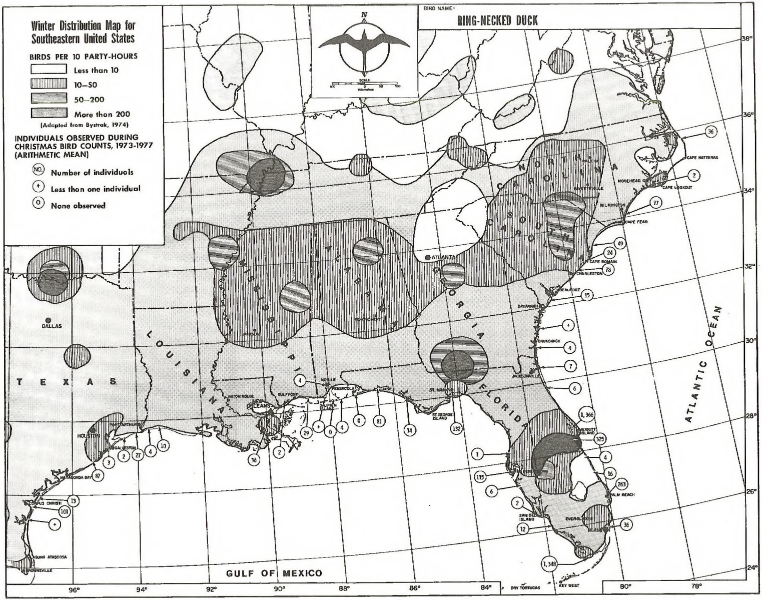
The Ring-necked Duck breeds from the Mackenzie District and British Columbia east across Canada to Newfoundland and Nova Scotia, and as far south as northeastern Washington, northern North Dakota, Minnesota, Wisconsin, Michigan, New York, Vermont, Maine, and Massachusetts (Mendall 1938, Chandler 1953, AOU 1957). Recent northward extension of the breeding range into Labrador has also been noted (Gillespie and Wetmore 1974). To the south of this general breeding distribution, local irregular breeding has been reported from Oregon, California, Nevada, Montana, Colorado, Nebraska, South Dakota, Illinois, Indiana, and Pennsylvania (AOU 1957, Mendall 1958). The principal breeding ground is the closed boreal forest of northwestern Canada (Bellrose 1976).

In winter, the Ring-necked Duck can be found from Massachusetts southward along the Atlantic coast to Florida, the West Indies, Gulf coast states, and Mexico (AOU 1957, Bond 1971). In the southeast, it may occur inland as far as Tennessee and Arkansas (Johnsgard 1975). Along the Pacific coast, these ducks winter from southern British Columbia to Baja California, in most of Mexico, and in Central America as far south as Panama (AOU 1957, Mendall 1958).

Ring-necked Ducks winter along the Pacific coast from British Columbia south to Baja California, in Mexico and Central America to Guatemala, and along the Atlantic coast (Map 20) from Massachusetts south to Florida, the West Indies, the Gulf coast states, Mexico, and Central America (AOU 1957, Mendall 1958). January waterfowl inventories indicate that between 240,000 and 300,000 Ring-necked Ducks winter in North America. Over half of the birds in the Atlantic Flyway winter in Florida (Bellrose 1976). Large concentrations have also been noted in Cuba (15,000) and in the Dominican Republic (5,500) (Crissey in Bellrose 1976). Two-thirds of the birds wintering in the Mississippi Flyway occur in Louisiana (about 73,000), and slightly over 10,000 Ring-necked Ducks winter from east Texas to Yucatan on the Gulf coast.

SUSCEPTIBILITY TO OIL POLLUTION

Three Ring-necked Ducks were among more than 3,200 oiled dead birds found after a spill in San Francisco Bay, California, in 1971 (Smail et al. 1972). Because of its preference for fresh water, the Ring-necked Duck is much less vulnerable to marine oiling than other diving ducks.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10—50
50—200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
BIRD NAME:
RING-NECKED DUCK
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
ATLANTA
HOUSTON
GALVESTON
PORT ARTHUR
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
FAYETTEVILLE
MOREHEAD CITY
CAPE LOOKOUT
CAPE HATTERAS
MERRITT ISLAND
PALM BEACH
SANIBEL ISLAND
EVERGLADES
DRY TORTUGAS
KEY WEST
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°
36
2
77
49
24
78
15
+
4
7
6
1,366
325
4
16
263
36
1,348
12
2
6
115
1
132
14
81
0
4
0
+
29
2
36
4
10
4
27
2
3
87
13
101
+

Map 20

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GREATER SCAUP

(Aythya marila)

[DA: Bjergand, DU: Toppereend, EN: Scaup, FI: Lapasotlea, FR: Milouinan, Canard milouinan; GE: Bergente, IC: Duggond, IT: Moretta grigia, JA: Suzugamo, NW: Bergand, PO: Ogorzalka, RU: (Marine Scaup), SP: Porron bastardo, Cos grande, SW: Bergand]

GENERAL DISTRIBUTION

North America The Greater Scaup breeds in North America from Alaska through Arctic Canada east to the shores of Hudson Bay, with isolated records or casual nesting in northwestern British Columbia, central Alberta, and the Gulf of St. Lawrence. It nests also in the Chima region of northern Ungava and commonly in a small area in southeastern Newfoundland (Palmer 1976b). Palmer (1976b) pointed out that breeding records for North Dakota and Michigan (AOU 1957) are probably erroneous; the validity of a recent breeding record from Florida (Montalbano 1977) is also dubious (Palmer, pers. comm.).

Greater Scaup winter chiefly on the sea coasts, along the Pacific from the Aleutian Islands to California, on the Atlantic from Newfoundland to central Florida, and along the Gulf coast from Florida to coastal Texas. Others winter inland on the eastern Great Lakes and to a lesser extent along the drainage of the Mississippi River. The southern limits in western North America are in Sinaloa and northern Baja California, and in eastern North America are in southern Florida, the Bahamas, and western Cuba (Palmer 1976b).

World Distribution Greater Scaup also breed in Iceland, at least sporadically in Great Britain, and regularly through northern Eurasia from Fenno-Scandia to Siberia and islands in the Bering Sea (Cramp et al. 1977, Johnsgard 1978). Eurasian populations winter in western Europe, along the Mediterranean, in the Black Sea and Persian Gulf, in some parts of northern Africa, in India, and along the shores of Japan, China, and Korea (Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina The Greater Scaup is a fairly common winter resident from October to April in the waters of Pamlico Sound and adjacent areas (Potter et al. 1980). It is occasionally found inland on rivers and lakes (Pearson et al. 1942).

Bellrose (1976) reported the proportion of Greater Scaup among both species of scaup killed during hunting seasons from 1967 to 1969. He then used these figures to estimate how many of the birds seen on January waterfowl surveys were Greater Scaup. If his proportions are still valid, then the number seen in North Carolina during the January 1975 survey (Goldsberry et al. 1980) was about 1,175 birds.

South Carolina This species is a winter resident, of uncertain numerical status, but considered uncommon along the coast and inland (Potter et al. 1980). It is generally present from late October to early April; an occasional individual may be observed in early summer. It prefers to inhabit large bays, estuaries, and the ocean, and seldom visits freshwater areas (Sprunt and Chamberlain 1949). The scarcity of inland records no doubt partly reflects the difficulty in separating this species from the Lesser Scaup in the field (Fatora 1965, Burton 1970).

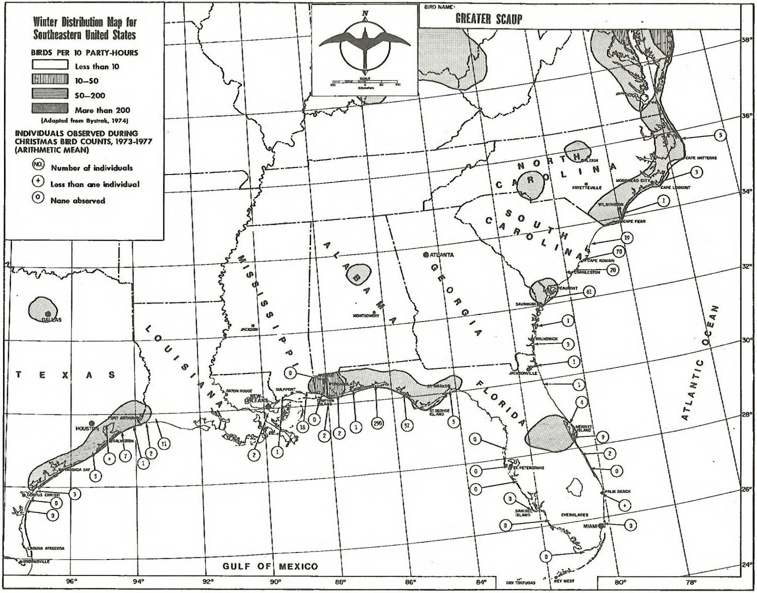
Following Bellrose's (1976) methods of computation, about 150 Greater Scaup were seen during the 1975 mid-winter waterfowl survey. This duck is probably more abundant than indicated, however, since 2,000 were reported in Charleston Harbor, 7 February 1976 (Teulings 1976b); four recent Christmas Counts average about 170 birds (Map 21).

Georgia Burleigh (1958) stated that the Greater Scaup is a rare and rather local winter resident on the eastern edge of Georgia; authentic records of its occurrence are very few. In winter this bird is notably maritime in its habits. On the Atlantic coast it is rarely seen on inland waters, preferring saltwater bays and sounds where it gathers in dense rafts. Burleigh (1958) also stated that the paucity of records reflects the difficulty in separating the two scaup species in the wild. Perhaps as many as 1,300 birds were present during the January winter waterfowl survey if Bellrose's (1976) method of estimation is used. On the other hand, recent Christmas Counts (Map 21) continue to indicate that very small numbers are present.

Florida The Greater Scaup is a fairly common winter resident in Florida, occurring chiefly in the northern half of the state in the Gulf, less abundantly on bays and sounds along the Atlantic coast, and occasionally on the larger rivers where it associates with the Lesser Scaup (Sprunt 1954, Kale 1979 ms a, 1979 ms b). An isolated record of breeding was reported (but poorly documented) in 1975 on the Merritt Island NWR, Brevard County, Florida (Montalbano 1977). Bellrose (1976) estimated that 9.1% of the scaup wintering in Florida were Greater Scaup. If this figure is reasonably accurate, then about 26,750 were seen on the January 1975 waterfowl survey (Goldsberry et al. 1980). This figure contrasts strongly with the few sighted on recent Christmas Counts (Map 21).

Alabama Imhof (1976b) stated that the Greater Scaup is locally common in winter on the Gulf coast of Alabama, rare in late fall and winter in the Tennessee Valley, and occasional in the intervening area. Along the coast, it is usually found only on the outermost bays. The maximum number reported along the coast is 600 at Grand Bay, Mobile County. A pair was observed at close range on 16 June 1956 at Dauphin Island, but there is no indication that the species breeds in Alabama (Imhof 1976b).

Mississippi The Greater Scaup seems to be quite uncommon in Mississippi; there are few reported observations. Burleigh (1944) knew of a single specimen from along the coast, a bird taken in May at Gulfport. More recent reports suggest that small numbers may be in the state from October to March (Weber and Jackson 1977, Jackson and Cooley 1978a). As elsewhere, however, the difficulty in separating the two scaup in the field may lead to underestimates of the abundance of this less common species.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
BIRD NAME:
GREATER SCAUP
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
JACKSON
GULFPORT
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
CAPE LOOKOUT
MOREHEAD CITY
CAPE HATTERAS
FAYETTEVILLE
RALEIGH
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
KEY WEST
DRY TORTUGAS
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 21

Louisiana This species frequents coastal waters between early November and early April (Lowery 1974). Bellrose (1976) estimated that about 60,000 Greater Scaup winter here. Using his methods of estimation, perhaps not less than 11,400 were seen during the incomplete 1975 waterfowl survey of Louisiana (Goldsberry et al. 1980).

Texas Oberholser (1974) noted that this species is a winter-resident in Texas, generally occurring between 18 October and 20 May. It is scarce to rare on the Gulf coast and rare elsewhere. Bellrose (1976) estimated a wintering population of about 600 birds during the late 1960's. His methods of computation lead to an estimate of about a dozen Greater Scaup present during the 1975 winter survey (Goldsberry et al. 1980). Recent Christmas Counts (Map 21) suggest that it is more common there. Historic records suggest that this species was much more abundant earlier in the century.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding In North America, the Greater Scaup breeds from coastal and Arctic Alaska east through the Yukon and the Northwest Territories to extreme northern Manitoba and Ontario and western Quebec. Other populations regularly breed on the coast of Ungava Bay and in Newfoundland (Palmer 1976b). Bellrose (1976) suggested that about three-quarters of the Greater Scaup in North America breed in Alaska, principally in the Yukon Delta; he estimated that 550,000 breed there and suggested that another 200,000 breed in Canada.

The Greater Scaup is also a common breeding bird in the Old World. There, "the Scaup" is found nesting across the northern Palearctic from Iceland west to northern Russia and Siberia and south to about 60°N, with occasional breeding farther south in the Faeroes, Britain, and the south Baltic (BOU 1971). Figures listed in Cramp et al. (1977) indicate breeding populations of about 20,000 in Iceland, 2,000 in Finland, and 230,000 in the western U.S.S.R.

Winter The Greater Scaup winters in North America along the Pacific coast from the Aleutian Islands south to California (rarely northern Baja California), along the Atlantic coast from the Gulf of St. Lawrence to Florida, and along the Gulf coast south to the Mexican boundary (AOU 1957). January surveys by the U.S. Fish and Wildlife Service indicated that about 60% of the total wintering population is in the Atlantic Flyway; nearly half of these winter between Massachusetts and New Jersey. South of Chesapeake Bay, Greater Scaup become much less abundant, and are apparently least abundant off Georgia, and most abundant off Florida. The status of this species on the Gulf coast is poorly known but it is apparently abundant off Florida and Louisiana.

A total of about 1,131,800 "scaup" were reported within the contiguous United States on the 1975 waterfowl survey (Goldsberry et al. 1980). Bellrose's

(1976) estimates (a) suggest that about 358,000 of these scaup were Greater Scaup; his earlier calculations indicated a total of about 317,000 birds. Probably somewhat more than 12% of the Greater Scaup seen in 1975 wintered in the southeast, a substantial majority of them in waters off Florida and Louisiana.

The difficulty in identifying the Greater Scaup in the field has been frequently noted above. The very similar Lesser Scaup is more abundant in the southeast, and there is a tendency either to apply the name of the more common species or to hedge by not identifying scaup to species. Thus, reliance on observer's reports is likely to convey an erroneous concept of the relative abundance of the two species. Population estimates given by Bellrose (1976) are based on the total number of scaup detected on aerial surveys, allotted in proportion to the percentage of Greater and Lesser Scaup found in spot checks of hunters' bags, a method that has obvious shortcomings.

Migration The principal migration routes of Greater Scaup from their breeding grounds in northwestern North America extend east-southeast to the principal wintering grounds on the northern Atlantic coast. Some, perhaps most, of the birds wintering along the Pacific coast move south well offshore but others apparently follow a more interior pathway through western Canada. Greater Scaup wintering along the Gulf coast apparently diverge from east-southeast routes to fly south along the Mississippi drainage and through Iowa and Georgia to western Florida (Bellrose 1976).

HABITAT

Nesting Preferred nest sites of the Greater Scaup in open boreal forest (taiga) of North America are islands in large lakes. In the Yukon Delta, however, these birds nest on marshy, lowland tundra on slightly elevated areas near ponds (Bellrose 1976). Some nests have been found as much as a thousand meters from water (Palmer 1976b), but most are close to ponds or other bodies of water (Bellrose 1976, Palmer 1976b). Similar breeding habitats have been reported in the Old World; in Scandinavia they frequent upland birch communities (Cramp et al. 1977).

Nests are usually concealed in tall grass (Bellrose 1976). Preferred cover is usually grass-sedge, mostly Glyceria (R. Kirkpatrick in Palmer 1976b), but nests have also been found in rock crevices, under shrubs, and on floating vegetation (Bellrose 1976, Palmer 1976b).

Feeding Greater Scaup have a pronounced tendency to feed in open water and are the most marine of the genus Aythya (Cramp et al. 1977). They prefer to feed in water about 1-4 m (3-13 ft) deep (Palmer 1976b). Non-breeding birds frequently congregate in large numbers over mussel beds or other areas supplying rich food resources (Cramp et al. 1977).

(a) We assumed that the estimates Bellrose (1976) made for the proportion of Greater Scaup among scaup seen in Louisiana (6.6%) applies also for Mississippi and Alabama. For the flyway as a whole we used his estimate that 13.7% of scaup seen were Greater Scaup. We also used his proportions of 1.4% for Texas, 2.3% for the Central Flyway, and his overall proportion of 37.7% for the Pacific Flyway.

Winter and Offshore During the winter Greater Scaup prefer salt and brackish bays and estuaries, as well as large areas of open marine and nearby fresh water (Palmer 1976b). Habitats used by non-breeding birds in the Old World are usually marine and may be tidal and exposed to severe weather. These habitats include partially landlocked, low saline seas, such as the Baltic. Brackish and fresh waters are used less extensively, and rivers are uncommonly frequented (Cramp et al. 1977). Scaup wintering off the coast of Connecticut did not feed on mudflats but were seen feeding in breaking surf (Cronan 1957 in Palmer 1976b).

FOOD AND FEEDING BEHAVIOR

Greater Scaup feed primarily by diving using only the feet for propulsion, but they occasionally tip-up and dabble as well. They feed throughout the day, often in large flocks, and may also feed at night, particularly when disturbed (Cramp et al. 1977). One study conducted off Connecticut (Cronan 1957 in Palmer 1976b) reported that these birds made dives of up to to 23 ft (7 m) but that most dives were much more shallow. These dives averaged 20.4 sec, with a range of 9-33 sec.

Summaries by Palmer (1976b) and Cramp et al. (1977) provide detailed accounts of the foods eaten in the New and Old Worlds, respectively; these should be consulted for more extensive listings of foods eaten by Greater Scaups. Our remarks below are largely condensed from these two sources.

Food may be either vegetable or animal in origin and may vary considerably from area to area and from season to season. It was nearly equally divided (46.5% - animal) in one study of 752 stomachs from North America. Pondweeds (Potamogeton, Ruppia, Phyllospadix, etc.) were the principal plants eaten and constituted 18.9% of the diet. Bivalve molluscs (23.2%), snails (15.9%), aquatic insects (7.2%), and crustaceans (6.8%) were the principal animal foods consumed.

In some areas (e.g., along coastal lakes and streams in British Columbia), fish and fish eggs may be important items of diet. In other areas, muskgrass (Chara) may form the bulk of the food. A number of studies indicate that bivalve molluscs constitute the major food of birds wintering on saltwater.

Little quantitative information on the food habits of Greater Scaup in the southeastern United States is available. We summarize this material by state below.

Florida Stieglitz (1967) reported the foods eaten by four Greater Scaup wintering near Cabbage Island in Apalachee Bay on the Florida Gulf coast. These birds had eaten almost solely gastropods (85.2% by volume) and mud crabs (Rithropanopeus sp. - 13.8%). Molluscs consumed to the greatest extent were greedy dove-shell (Anachis avara - 35.4%), variable nassa (Nassarius ambiguus - 26.3%), and Atlantic modulus (Modulus modulus - 20.0%). The only plant food found was shoalgrass (Diplanthera wrightii - 1.0%).

Mississippi Christmas (1960) reported Greater Scaup feeding on discarded, dead Gulf menhaden (Brevoortia patronus) on a small bayou near Davis Bay.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Nests are begun in June, mainly in mid-June, according to studies cited by Bellrose (1976) and Cramp et al. (1977).

Mean Clutch Size Clutches on islands in Great Slave Lake, Northwest Territories, consisted of 4-21 eggs, although the larger ones contained eggs deposited parasitically by other species. The average clutch was 9.0, or 8.5 with the parasitized nests omitted from the calculations (Trauger and Bromley 1975 in Bellrose 1976). Palmer (1976b) stated that the clutch size is commonly 7-9 eggs. The modal clutch size for first clutches in Finland was 11; the mean for first clutches in Iceland was 9.7 (authors cited in Cramp et al. 1977).

Incubation Period Palmer (1976b) found no data on the incubation period for North American birds but cited a study (Hilden 1964) that reported 24-25 days for Greater Scaup in Finland.

Hatching Success Few data are available. In two studies cited by Bellrose (1976), 25-45% of the nests observed were successful, but the number of birds hatched in these nests was not given. Cramp et al. (1977) listed hatching success rates of 77% for Finnish birds and 67.9% for Icelandic birds; the range for the latter over a period of ten years was 47.6% to 84.3%.

Fledging Success Few data are available. Bellrose (1976) believed that mortality of ducklings was low. In Finland only 6.5% of the eggs laid resulted in birds raised to fledging (Hilden 1964 in Cramp et al. 1977).

Age at Fledging Data are not available for North American birds. Cramp et al. (1977) reported a fledging period of 40-45 days.

Age at First Breeding There is evidence that most females do not nest until their second year or later (Trauger in Bellrose 1976), but some yearling females breed; other data indicate that some yearling males also breed (Palmer 1976b).

Mortality of Eggs and Young Most of the relatively few eggs that did not hatch during a study conducted in Finland (Hilden 1964 in Johnsgard 1975) were lost to crows and ravens; a few eggs were also lost to floods. Sources of mortality for New World Greater Scaup are virtually unknown, but Bellrose (1976) believed that mortality was slight among unfledged ducklings.

Renesting We have found no information on renesting by North American Greater Scaup. Bengtson (1972a in Cramp et al. 1977) reported that 31% of 45 Icelandic females re-laid after loss of the first clutch. The mean clutch size for second clutches was 7.0.

Maximum Natural Longevity Banding records in the United States indicated that a bird banded in Alaska reached a minimum age of 18 years, 4 months (Clapp et al. in press). Greater Scaup in the Old World have attained an age of at least 13 years in the wild (Rydzewski 1978).

Weight Bellrose (1976) listed the average weight of 177 adult males as 1.82 lb (826 g) and that of 44 adult females as 1.65 lb (748 g). Immature males (n = 190) and immature females (n = 124) averaged 1.71 lb (776 g) and 1.62 lb (735 g), respectively.

SUSCEPTIBILITY TO OIL POLLUTION

The Greater Scaup is a known victim of oiling at sea. Bourne (1972) reported casualties due to a very small oil slick in the Firth of Forth at Seafield, Scotland, and noted the extreme vulnerability of species (such as the scaup) that concentrate along coasts for foraging. Joensen (1972b) reiterated this point, noting that Greater Scaup in Danish waters were very vulnerable to oiling because large proportions of their wintering populations were often concentrated in very small areas. Greater Scaup were listed among oiled species in a spill in San Francisco Bay in 1973 (Holmes and Cronshaw 1977). Some 1,500 scaup (including Greater Scaup) died following seven spills in the Delaware River and Chesapeake Bay, 1973-1978 (Perry et al. 1979). Other reports of oiling deaths are summarized in Table 5.

The Greater Scaup is clearly a species that may be seriously affected by oil pollution. However, the proportion of wintering Greater Scaup that utilize the coastal waters of the southeast is relatively small, reducing the chance of major population effects if oiling were to occur in that area.

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Table 5. Number of dead birds and number and percentage of dead Greater Scaup found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Greater Scaup	Percentage of Greater Scaup	Source
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	8	0.34	Joensen 1972a
Bornholm, Denmark	Jan.-Feb. 1968	466 (a)	1	0.21	Joensen 1972a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (b)	1	0.09	Greenwood and Keddie 1968
Northeast Britain	Jan.-Feb. 1970	10,992 (a,c)	42	0.38	Greenwood et al. 1971
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	2	0.09	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,749 (a)	14	0.29	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	7	0.08	Joensen and Hansen 1977
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,c)	1	0.15	Gorski et al. 1977
Firth of Forth, southern Scotland	Feb. 1978	680 (a)	130	19.12	Campbell et al. 1978

(a) Total includes only those birds identified to species.
(b) Total includes both live and dead oiled birds.
(c) Total includes some birds that were not oiled.

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LESSER SCAUP

(Aythya affinis)

[FR: Petit milouinan, GE: Veilchenete, SP: Costero chico, US: Dos-gris]

GENERAL DISTRIBUTION

North America The primary breeding range of the Lesser Scaup extends from north-central Alaska east to the northwestern Northwest Territories, southeast to southwestern James Bay, south in the interior to southern British Columbia, northeastern Idaho, northwestern Wyoming, northeastern Montana, and northwestern North Dakota, and east to northeastern South Dakota and northwestern Minnesota (Palmer 1976b). It also breeds at scattered localities farther south and is apparently extending its breeding range to the east in Canada (Palmer 1976b). To the south of the primary breeding range, the Lesser Scaup breeds or has bred in northern California, Utah, southern Washington, eastern Oregon, northern Idaho, northern Arizona, Nebraska, southern Wisconsin, Michigan, northeastern Iowa, Ohio, and several eastern localities in Canada (Bellrose 1976, Palmer 1976b).

The northern limits for wintering Lesser Scaup are from southwestern British Columbia southeast to central and western Utah, northern Texas, eastern Kansas, and southwestern Iowa and from the southern Great Lakes to southeastern Massachusetts (Palmer 1976b). South of these areas, Lesser Scaup winter both inland and along the Pacific, Atlantic, and Gulf coasts of the United States; a notable proportion occurs along the Gulf. They also commonly winter off the coasts of Mexico and south at least to the Pacific coast of Guatemala (Bellrose 1976). The species is found locally and in small numbers in the rest of Central America (Palmer 1976b).

World Distribution The Lesser Scaup breeds only in North America, and largely winters there, although a few regularly winter in Bermuda and the Caribbean. The southern limits of distribution in mainland South America are the Cauca Valley and eastern Andes of Colombia, Venezuela, and western Ecuador (Palmer 1976b). Lesser Scaup have straggled to Hawaii, and there are reports of the species from Britain and Europe, although Palmer (1976b) doubted the validity of these reports.

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina The Lesser Scaup is a fairly common winter resident throughout the state (Pearson et al. 1942). Often locally abundant, large concentrations may be found along the coast (Potter et al. 1980). Most are present from October to May (Potter et al. 1980), but a few may remain in the summer (Teulings 1971c, 1972c).

Bellrose (1976) indicated that winter populations were on the order of 8,000 birds. The 1975 winter waterfowl survey by the U.S. Fish and Wildlife

Service (Goldsberry et al. 1980) (a) listed 8,500 scaup wintering off North Carolina. If this population is apportioned to species [as done by Bellrose (1976)], about 7,300 of these birds were Lesser Scaup.

South Carolina Sprunt and Chamberlain (1949) regarded the Lesser Scaup as a fairly common winter resident throughout the state, most abundant along the coast. Most are present from late October to mid-April (Sprunt and Chamberlain 1949); very small numbers are occasionally present during the summer (Burton 1970, Teulings 1976c).

Bellrose (1976) estimated that winter populations totalled about 16,000 birds. Calculations based on the 1975 winter survey (Goldsberry et al. 1980) suggest a population of less than than a thousand birds, although data from recent Christmas Counts (Map 22) indicate that Lesser Scaup are considerably more abundant in South Carolina than the winter survey indicated. A flock of ducks thought to contain more than 50,000 birds (most of them evidently Lesser Scaup) was seen in Charleston Harbor, 23 January 1970 (Teulings 1971b).

Georgia Lesser Scaup are common migrants and winter residents throughout Georgia and are abundant along the coast and offshore (Denton et al. 1977). Burleigh (1958) considered this species to be the most common migrant and winter resident among the ducks, and he reported that it preferred fresh-water areas. Excluding occasional summering birds, limits for dates of occurrence are 5 October (Denton et al. 1977) and 2 June (Teulings 1976c).

Estimates based on January waterfowl surveys (Bellrose 1976) indicate that the winter population is about 16,000 birds. Calculations based on the 1975 survey (Goldsberry et al. 1980) suggest that about 8,300 were present that year.

Florida Howell (1932) considered the Lesser Scaup the most common duck in Florida in winter and spring, an assessment with which Sprunt (1954) and Palmer (1976b) agreed. Kale (1979 ms a) noted flocks of up to 25,000 at Merritt Island NWR on the Atlantic coast; about that many are regularly reported on Christmas Counts from there (Map 22). As many as 68,000 Lesser Scaup have been reported in Tampa Bay on the Gulf coast (Fickett in Schreiber et al. 1975), and the species is abundant off both the peninsula and the panhandle. Bellrose (1976) estimated a wintering population of almost 285,000; an estimate derived from the 1975 waterfowl survey indicates that at least 267,000 were present that year.

Found throughout Florida, these ducks normally arrive in early October and remain until May. There are, however, July records for St. Marks NWR, and July and August records from Pensacola (Sprunt 1954). There is a nesting record from Lake Jackson, Wakulla County, in 1896, although the bird was thought to have been a cripple (Sprunt 1954); Kale (1979 ms b) indicated other isolated nesting records.

Alabama The Lesser Scaup is abundant in winter and on migration in Alabama. Although the species occasionally summers in the state, there are no records of breeding birds. These ducks prefer to winter on deep inland lakes and

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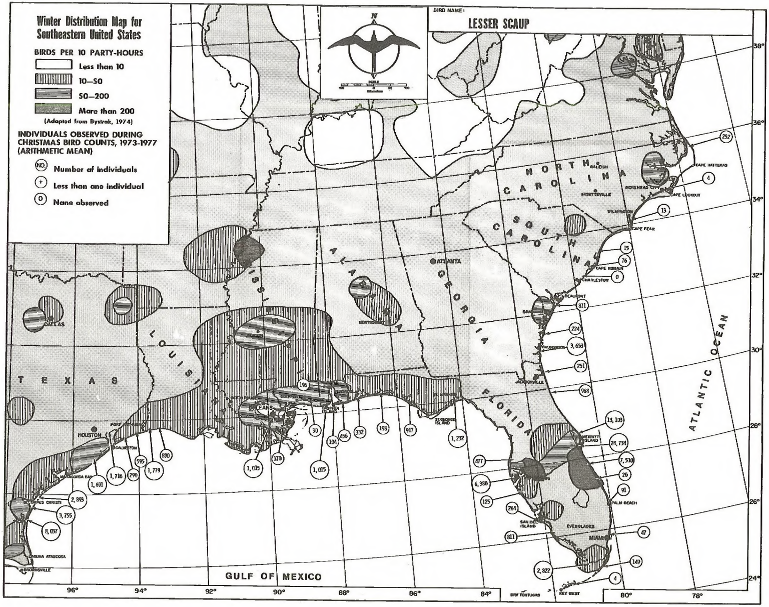
(a) We manipulated the data for Lesser Scaup in Goldsberry et al. (1980) as explained in the preceding account, q.v.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10—50
50—200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO.
Number of individuals
+
Less than one individual
0
None observed
N
SCALE
BIRD NAME:
LESSER SCAUP
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
CAPE HATTERAS
MOREHEAD CITY
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
ATLANTA
MONTGOMERY
JACKSON
BRUNSWICK
JACKSONVILLE
DALLAS
HOUSTON
GALVESTON
PORT ARTHUR
BATON ROUGE
NEW ORLEANS
DAUPHIN ISLAND
ST. GEORGE ISLAND
MERRITT ISLAND
PALM BEACH
SANIBEL ISLAND
EVERGLADES
MIAMI
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
DRY TORTUGAS
KEY WEST
252
4
13
15
76
0
811
224
3,653
251
968
13,108
24,734
7,510
20
91
47
149
4
2,822
811
264
125
6,380
477
1,232
917
198
332
456
104
1,015
30
170
196
1,015
890
1,779
595
290
1,716
1,691
2,893
3,755
8,037
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 22

ponds. Lesser Scaup also occur in large numbers along the coast where they are usually present from early October to early June (Imhof 1976b). On the Gulf coast, a maximum of 17,500 was counted at Dauphin Island on 20 April 1968 (Imhof 1976b); 2,200 scaup of both species were reported present during the winter of 1975 (Goldsberry et al. 1980). Most of these were presumably Lesser Scaup. Recent Christmas Counts (Map 22) from the vicinity of Dauphin Island averaged over a thousand birds, suggesting that the actual number wintering in the state is greater than that indicated by aerial waterfowl survey by the Fish and Wildlife Service.

Mississippi Burleigh (1944) considered the Lesser Scaup the most abundant wintering duck on the Mississippi coast, with numerous flocks also found on the larger freshwater ponds and in shallow saltwater areas. Birds arrived in early November and did not depart until late May. More recent reports include 10,000 Lesser Scaup at Bellfountaine Point (Jackson 1976), and 10,200 scaup (most probably Lesser Scaup) on the 1975 winter survey. This last census was incomplete (Goldsberry et al. 1980), however, and the total wintering population is no doubt larger. These scaup occur in Mississippi from as early as mid-October (Jackson and Weber 1976), and occasional birds have been reported through the summer (Jackson and Cooley 1978a).

Louisiana In some years, the Lesser Scaup is the most abundant duck wintering in Louisiana (Smith 1961 in Harmon 1962). They arrive in large numbers by late October and remain until early April. In winter these scaup often form rafts of thousands along the edge of the Gulf. Through late November or early December most Lesser Scaup remain on lakes and bays (Smith 1960 in Harmon 1962). They then move offshore into the Gulf of Mexico where they are evidently fairly common around oil production platforms (Harmon 1962). A few birds have been noted in summer (Lowery 1974).

Coastal Louisiana is one of the major wintering grounds for the Lesser Scaup; more than 1,500,000 were present there during the winter of 1960-1961 (Smith 1960 in Harmon 1962). Calculations based on data presented by Bellrose (1976) indicate more than three-quarters of a million are regularly present in winter; several hundred thousand more are present during the peak of fall migration. Bellrose (1976) reported that concentrations occur on Lakes Pontchartrain and Borgne, in coastal marsh, and offshore.

Texas During the winter, Lesser Scaup are locally abundant to common on the coast, and irregularly common throughout the state (Oberholser 1974). They are most numerous in the northern half of the state in spring and fall, and scarce to rare during the summer, particularly on the coast, although occasional flocks of 50-100 may linger.

Bellrose (1976) reported that Galveston Bay holds one of the largest concentrations (30,000 birds) in the Pacific Flyway. Other notable concentrations include 35,000 present in San Antonio Bay, Aransas NWR, 21 November 1977 (Webster 1978a), and 50,000 at Cove, 5 February 1977 (Webster 1977). Data provided by Bellrose (1976) suggest that some 98.6% of the scaup wintering in Texas are Lesser Scaup. If this figure is still applicable, then the 1975 January survey (Goldsberry et al. 1980) found about 187,000 Lesser Scaup wintering there.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Lesser Scaup nests only in North America. Most breed from north-central Alaska south to northeastern Idaho and northwestern Wyoming, southeast to northeastern Manitoba, thence south to northwestern Minnesota and northeastern North Dakota. Other small or local populations breed or have bred from northeastern California and eastern Oregon east across the northern Great Plains to Ohio. Breeding has also been reported on eastern James Bay in Quebec (Palmer 1976b).

Precise numbers of breeding Lesser Scaup are unavailable because the U.S. Fish and Wildlife Service does not distinguish between Greater and Lesser Scaup in surveys of the breeding grounds. According to Bellrose (1976), the total breeding population of both species of scaup is larger than that for any other duck except the Mallard. Estimated total breeding populations for these two species varied from 5,100,000 to 9,100,000 during 1955-75, with a mean of 6,900,000. The largest numbers of breeding birds are found in the open boreal forest of Canada (1,700,000 birds), in the closed boreal forest to the east (1,900,000), and in interior Alaska (600,000) (Bellrose 1976). The 1976 breeding ground survey (Larned et al. 1980) listed a total of about 6,900,000 breeding scaup.

Winter Lesser Scaup winter both inland and along the coasts of North America, with most wintering in the eastern half of the continent (Bellrose 1976). The southern limits of the wintering range are in the Caribbean and northern South America (Palmer 1976b). This scaup is more abundant along the coasts but is often found on fresh or brackish waters within these areas.

Bellrose (1976) estimated that 1,454,000 Lesser Scaup were wintering in the United States in the late 1960's, in addition to another 297,000 in Mexico. Smaller numbers winter in Guatemala, and about 7,500 winter in the West Indies, mostly in Cuba. Figures provided by Bellrose suggest that nearly 85% of the total wintering population is found in southeastern waters and along the coast of Mexico. Only a small proportion (ca. 10%) of those wintering within the United States are found in the western half of the continent. Most of the rest of the U.S. winter population occurs along the lower Mississippi drainage and along the central and northeastern Atlantic Seaboard (Johnsgard 1975). Major concentrations are found along the coast of Texas and Louisiana, along the central Gulf and Atlantic coasts of Florida, and off Georgia (Bellrose 1976, Map 22). Data from the 1975 winter survey (Goldsberry et al. 1980), while incomplete, suggest a wintering population in the United States and Mexico of no less than 983,000 that year. This decrease from the figures provided for early counts by Bellrose is probably more apparent than real, since several areas of concentration for this species in the Mississippi Flyway went unsurveyed.

Migration Most migrating Lesser Scaup move southeast from their primary breeding grounds in the northwestern portion of North America. The pathway used by the largest number of birds extends south-southeast from there to Lakes Winnepegosis and Manitoba, northwestern Minnesota, and to the Mississippi River between Burlington and Keokuk, Iowa (Bellrose 1976). Most Lesser Scaup fly from the latter area south to the Gulf, but substantial numbers continue southeast to the Gulf coast of Florida. Other important routes follow the coastlines south (Bellrose 1976). For further details on the migration of Lesser Scaup see Bellrose (1976) and Palmer (1976b); their interpretation of migratory routes may vary in detail.

HABITAT

Nesting Lesser Scaup nest near ponds, lakes, potholes, sloughs, marshes, in river deltas, on seasonally flooded flats, and on islands (Bellrose 1976, Palmer 1976b). They often nest semi-colonially, with the largest nesting concentrations in hardstem bulrush (*Scirpus acutus*) marshes along lakes with an abundant food supply (Palmer 1976b). This species preferred to nest in sedges in Lousana, Alberta, and in the Saskatchewan Delta; in the latter area most of the nests were on floating or semi-floating plants. In another part of Alberta juncus beds were preferred over mixed prairie (authors cited *in* Bellrose 1976). Studies cited by Bellrose (1976) indicate considerable variation in the proximity of the nest to water. Average distances listed in one pothole area with strongly fluctuating water levels ranged from 7 to 125 ft (2.1 to 38.1 m) over a period of four breeding seasons.

Feeding Lesser Scaup feed in a wide variety of habitats, often in immense rafts. Bellrose (1976) saw them foraging in roadside and farm ponds and on flooded fields only a few feet deep, as well as in water 10-40 ft (3- 12 m) deep that were 5-10 mi (8-16 km) offshore in the Gulf of Mexico. He stated that this species feeds more commonly in water 10-25 ft (3-8 m) deep. Palmer (1976b) indicated that Lesser Scaup preferred to feed in water 1-3 m (3-10 ft) deep.

Winter and Offshore Winter habitat of the Lesser Scaup consists of bays and estuarine waters, flooded coastal marshes, and open fresh water both inland and along the coast (Palmer 1976b). This scaup prefers more sheltered waters than the Greater Scaup (Bellrose 1976), but compact flocks of dozens to thousands of resting birds may be found well offshore (Palmer 1976b). Bellrose (1976) remarked that Lesser Scaup feed in deeper water than other diving ducks (except for the sea ducks, e.g., Oldsquaw).

FOOD AND FEEDING BEHAVIOR

Lesser Scaup feed principally by diving from the surface using the feet for propulsion; they will also "tip-up" in shallower water (Palmer 1976b). They tended to dive obliquely on ponds in Manitoba (Siegfried 1976b). Palmer (1976b) described diving behavior in more detail.

Palmer (1976b) suggested that Lesser Scaup in tidewater areas vary their times of feeding with the tide and remarked that they feed nearer shore at high tide. Males and females dove for mean periods of 10.3 and 13.2 sec, respectively, while foraging on ponds in Manitoba (Siegfried 1976b). On coastal impoundments in South Carolina, diving times varied from 6.3 sec in water 1.5 m (4.9 ft) deep to 16.6 sec in water 0.5 m (1.6 ft) deep (Alexander and Hair 1979). At these coastal impoundments Lesser Scaup fed by themselves or in loosely associated pairs. They fed at a mean rate of 5.1 dives per second; Alexander and

Hair (1979) found no significant difference between the sexes in the rate of diving or in diving time.

Lesser Scaup feed on a variety of foods but animal food predominates in most areas. Studies summarized by Bellrose (1976) report animal food making up as little as 1.0% of the diet (in North Carolina) to as much as 99.9% (off coastal Louisiana). Plant foods of particular significance in one area or another include pondweeds (*Ruppia*, *Najas*, *Zannichellia*, *Zostera*, and especially *Potamogeton* spp.), *Scirpus* sedges, wild celery (*Vallisneria spiralis*), sea lettuce (*Ulva lactuca*), muskgrass (*Chara*), coontail (*Ceratophyllum*), and shoalgrass (*Diplanthera*) (Bellrose 1976, Palmer 1976b).

Animal foods are also varied. Molluscs are frequently the most consumed food, according to studies cited by Palmer (1976b) and Bellrose (1976). Various aquatic insects may also be important in the diet, and fish and crustacea are also eaten. Amphipods are apparently the principal food in breeding areas and are also much eaten by migrants. Pelecypods, gastropods, or both may be the principal foods eaten in other areas (Palmer 1976b). More specific lists of foods eaten outside the southeast are found in Palmer (1976b) and Bellrose (1976). We give below summaries of studies of food habits of Lesser Scaup in the southeast.

North Carolina Quay and Critcher (1965) reported the gizzard contents of five wintering scaup collected on Currituck Sound, but they did not indicate which species of scaup was involved. Bellrose (1976) assumed, or independently learned, that these were Lesser Scaup, but the identification is still in doubt. In any case, these *Aythya* had largely fed on the seeds and vegetative parts of pondweeds (*Potamogeton* sp. - 57.3% by volume) and widgeongrass (*Ruppia maritima* - 46.8%). Other plant foods identified included waxmyrtle (*Myrica* - 10.0%) and the vegetative parts of southern naiad (*Najas guadalupensis*- 5.0%).

South Carolina The crop and gizzard of a single wintering Lesser Scaup collected near Georgetown in coastal South Carolina were nearly empty (Conrad 1965). Conrad found only trace amounts of six plants: widgeongrass, swamp and Pennsylvania smartweeds (*Polygonum hydropiperoides*, *P. pensylvanicum*), aneilema (*Aneilema keisak*), common spikerush (*Eleocharis palustris*), panicgrass (*Panicum* sp.), and a sedge (*Carex* sp.).

Kerwin and Webb (1972) reported the foods eaten by 15 scaup in coastal South Carolina. Their sample was comprised of both Lesser and Greater Scaup, so we do not summarize their information on food habits here. Bellrose (1976) also attributed this report to Lesser Scaup, which makes the validity of the report made in North Carolina (see above) more suspect.

Landers et al. (1976) reported foods eaten by 21 Lesser Scaup at coastal impoundments in South Carolina, but they listed only the plants eaten. Plant material comprised 89.8% (by volume) of the diet and consisted almost solely of two plants, widgeongrass (67.1%) and saltmarsh bulrush (*Scirpus robustus* - 20.0%).

Louisiana Chamberlain (1959) examined the gizzards of 9 scaup collected on Rockefeller Refuge in Cameron Parish. He gave no detailed list of the foods eaten, but indicated that plant seeds occurred in all gizzards, insects in one, and molluscs in five. Harmon (1962) studied the food habits of Lesser Scaup wintering off the Louisiana coast. He examined the gullets and gizzards of 32 scaup collected from 100 yards (91 m) to 4 mi (6.4 km) south of Rockefeller Refuge, and found that 99.8% of the food was surf clams (*Mulinia lateralis*).

Rogers and Korschgen (1966) conducted an extensive study of the food habits and reported the stomach contents of 37 Lesser Scaup. Twenty of these were collected in December 1959 in marshes around Lake Borgne, near New Orleans; the rest were taken from roadside ditches and ponds near Grand Chenier in late February and early March 1960. These birds had subsisted largely on fish (41.8% by volume) and crustaceans (16.6%); the only fish identified in the remains was sheepshead minnow (*Cyprinodon variegatus*). The crustacean foods identified were crayfish (Cambarinae - 7.0%), freshwater shrimp (*Palaemonetes* sp. - 4.5%), sideswimmers (*Hyalella* sp. - 3.1%), and opossum shrimp (Mysidae - 1.3%). Small amounts of insects (4.0%) and snails (1.0%) were also eaten. Vegetable matter made up 37.3% of the diet. Identified plant foods were sawgrass (*Cladium jamaicense* - 6.9%), bulrush (*Scirpus* spp. - 3.8%), and widgeongrass (1.9%); the rest of the food consisted of small spiral shells (*Nassarius acutus*).

Texas Twenty wintering Lesser Scaup collected on the Laguna Madre had eaten 22.1% plant food, all of which was shoalgrass - *Diplanthera wrightii* (McMahan 1970). Of the rest, 39.1% was unidentified organic matter. Snails (12.2%), clams (15.2%), and decapod crabs (10.8%) formed the bulk of the animal foods, but fish fragments (0.2%) and shrimp (0.4%) had also been ingested. One clam (*Anomalocardia cuneimeris* = *A. auberiana*) was eaten more than any other animal (Emerson and Jacobson 1976).

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying The Lesser Scaup is a late-nesting duck. Nesting may begin in some areas in mid-May, but the peak of nesting is generally in early June. Some nests may not be started until July (studies summarized by Bellrose 1976).

Mean Clutch Size The average clutch in 880 nests observed in studies in 10 breeding areas was 9.0 eggs (Bellrose 1976). Palmer (1976b) reported that the clutch size was usually 9-11 eggs, and noted one study (Keith 1961) in which mean clutch size declined during the laying period (from 10.6 for eggs laid before 16 June to 8.5 for those laid after 30 June).

Lesser Scaup sometimes lay eggs in the nests of other scaup or other species of ducks (Palmer 1976b); one "dump nest" contained 26 eggs (Phillips 1925 *in* Palmer 1976b). This trait makes calculation of true clutch size difficult, and several authors have assumed that all clutches containing more than 14 eggs are the result of the efforts of more than one female.

Incubation Period Palmer (1976b) reported the incubation period as 21-22 days and cited one study (Vermeer 1968) that gave a range of 21-27 days. Bellrose (1976) reported that the average incubation period was 25 days.

Hatching Success In a series of studies involving more than 1,000 nests, about 43% were successful (Bellrose 1976). The average number of hatched young per successful nest was about 8.3. Nesting success (i.e., the proportion of nests in which eggs hatch) varies considerably from area to area and from year to year. Studies cited by Palmer (1976b) give a range of 27% to 83%. Palmer (1976b) pointed out that the proportion of eggs hatching in nests in which at least some hatch is high, and cited figures of 83.3% and 91% for two studies conducted in southeastern Alberta.

Fledging Success Because broods are often combined during development, it is difficult to trace the fate of individual broods and to document fledging. There are indications, however, that post-nesting success is high (Bellrose 1976).

Age at Fledging Young scaup are able to fly at ages of 45-50 days, according to Bellrose (1976). Palmer (1976b) reported that age of first flight could be estimated as 47-54 days.

Age at First Breeding Although some Lesser Scaup attempt breeding at one year, most do not do so until two years of age (Trauger 1971, Bellrose 1976).

Mortality of Eggs and Young Mammals, especially skunks, and birds, especially corvids, are responsible for most nest losses (Bellrose 1976). Nests placed near larid colonies may escape egg predation by crows, but the gulls take large numbers of the young that hatch (Vermeer 1968 in Bellrose 1976).

Renesting In an experimental study in which first clutches were removed before incubation began, 5 out of 31 scaup renested once. One renested twice and another three times (Hunt and Anderson 1966). Another study cited by Bellrose (1976) reported no renesting, yet another assumed that about 39% of the birds renested.

Maximum Natural Longevity A banded individual reached an age of at least 18 years and 4 months (Clapp et al. in press).

Weight The average weight of 130 males was 1.9 lb (860 g), and the average of 144 females was 1.7 lb (770 g) (Nelson and Martin 1953).

SUSCEPTIBILITY TO OIL POLLUTION

Lesser Scaup are one of the waterfowl that have suffered large losses to oil pollution in North America. It may also be the species of anatid most susceptible to oil pollution in the southeast. More than 2,000 Lesser Scaup were killed by oil during the spring migration of 1963 (Anderson and Warner 1969a, 1969b). The sources of the oil were massive spills of crude and soybean oil above the junction of the Minnesota and Mississippi rivers in December 1962 and January 1963 (Peller 1963). At least 1,510 scaup died following five spills on the Delaware River and two on the Chesapeake Bay in the period from 1973 to 1978 (Perry et. al. 1979). Most (93.4%) of the scaup mortality occurred in the marine habitat of Chesapeake Bay. Perry et al. (1979) did not report which species of scaup was involved in this kill. Most, however, were presumably Lesser Scaup because large numbers of this species winter in Chesapeake Bay (Bellrose 1976) and because the Greater Scaup is considerably less abundant there. In the southeast 300 to 500 ducks, mainly Lesser Scaup, died in Chocolate Bay following a leak from an oil barge at Port Lavaca, Texas, in the late 1940's (Singleton 1953). Stout and Cornwell (1976) reported that scaup (presumably both species) were the most frequently (47%) reported victims of oiling among banded waterfowl.

The Lesser Scaup is abundant in winter in the southeast. Although many remain on inland waters, large rafts form offshore and in bays and estuaries. They also occurs around oil-production platforms. A high proportion of the total Lesser Scaup population winters in the southeast, and sizeable numbers often occupy habitats more likely to be oiled than those occupied by other potentially highly vulnerable species (e.g., Redhead). Consequently, we think that this species is one that is potentially at very high risk from oil-development activities in the southeast. Administrators involved in programs developing petroleum resources should carefully consider their programs' effects in areas where this species congregates in large numbers.

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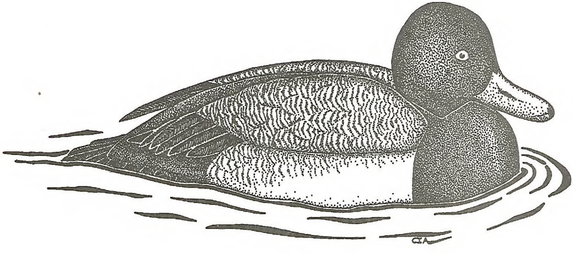


COMMON EIDER

(Somateria mollissima)

[DA: Ederfugl, DU: Eidereend, EN: Eider-Duck, FI: Haahka, FR: Eider a duvet, GE: Eiderente, IC: AEderfugl, IT: Edredone, NW: AErfugl, PO: Edredon, SP: Eider, SW: Ejder]

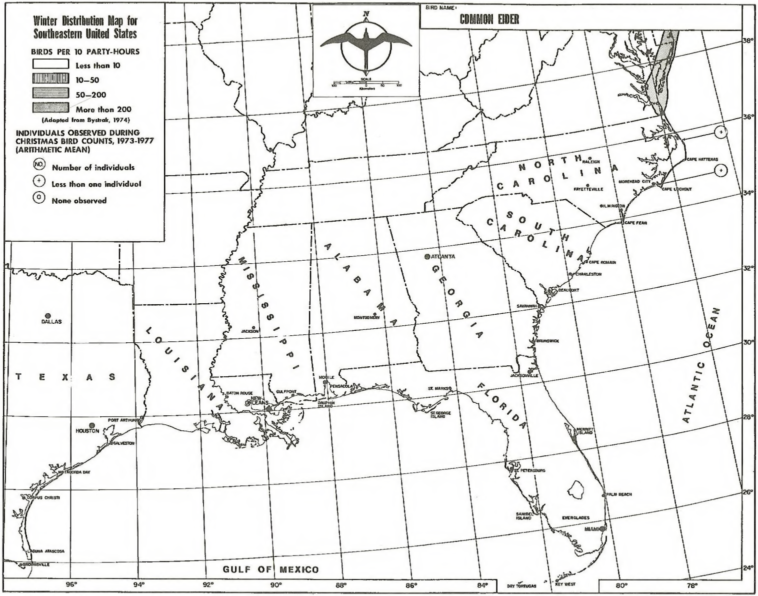
GENERAL DISTRIBUTION

The Common Eider nests very near the coast of Arctic North America from southwestern Alaska and the Aleutian Islands around the western and northern shores of Alaska, the Arctic shores of Canada (with a gap at about 100° W latitude), islands in the Canadian Archipelago, the shores of Hudson Bay, and the Ungava Peninsula, south along the Atlantic coast of Canada to Newfoundland, the St. Lawrence Estuary and Gulf of St. Lawrence, the Maritime Provinces, and Maine. In winter this eider is found along the Pacific coast from the Aleutian Islands south rarely to Washington, and in eastern North America in the open waters of Hudson and James bays and on the Atlantic coast from Labrador south to Long Island. Some birds reach Virginia and North Carolina, and they are casual to Florida. There are scattered records from inland states and provinces (AOU 1957, Palmer 1976b). The Common Eider also nests on the coasts of Greenland, Iceland, northern Europe, and Asia.

The Common Eider is found only uncommonly in the southeastern United States. There are records almost every year in North Carolina (Map 23), but of only one or a few birds each year. Literature surveyed for this report revealed only seven records for South Carolina, 1962-79, of one or two birds on each occasion. The seven records for Florida, 1955-73, include one for the Dry Tortugas (Petrovic and King 1972), perhaps the most southern record for the species, and one from the Gulf coast (Sprunt 1963), the only definite report from the Gulf.

SUSCEPTIBILITY TO OIL POLLUTION

Like other sea ducks that gather in large concentrations in the open ocean, the Common Eider is very susceptible to oil pollution. Oiling incidents have been frequent and large numbers of birds have been involved in some (Table 6). However, the Common Eider is uncommon in waters off the southeastern United States, where sightings have been of one or a few birds at a time, rather than great rafts, and close inshore rather than well out to sea. Although individuals would remain highly vulnerable in the southeast, damage to the Common Eider population by oiling in this area would be virtually nil.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10—50
50—200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
N
SCALE
Kilometers
BIRD NAME:
COMMON EIDER
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
MOBILE
PENSACOLA
GULFPORT
DAUPHIN ISLAND
BATON ROUGE
NEW ORLEANS
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
PALM BEACH
SANIBEL ISLAND
EVERGLADES
MIAMI
DRY TORTUGAS
KEY WEST
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
+
+
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 23

Table 6. Number of dead birds and number and percentage of dead Common Eiders found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Common Eiders	Percentage of Common Eiders	Source
North Sea coast, Denmark	1957-1958	92 (a)	5	5.43	Joensen 1972a
North-central Kattegat, Denmark	Jan.-Feb. 1962	1,723 (a,b)	254	14.74	Joensen 1972a
Southeast Kent, England	winters of 1963-64 to 1965-66	509 (a)	2	0.39	Gibson 1966
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	208	8.88	Joensen 1972a
North Sea coast, Denmark	1965-1966	803 (a)	1	0.12	Joensen 1972a
Northeast England	Jan. 1966	805	5	0.62	Parrack 1967
Pagham Harbour area, W. Sussex, England	Jan.-Feb. 1967	91 (a,c)	5	5.49	Phillips 1967
Bornholm, Denmark	Jan.-Feb. 1968	466 (a)	1	0.21	Joensen 1972a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (c)	1,127	96.49	Greenwood and Keddie 1968
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	1,683	70.83	Joensen 1972b
Laeso-Vendsyssel, Denmark	Dec. 1969	1,362	1,081	79.37	Joensen 1972b
Northeast England	Jan.-Feb. 1970	10,992 (a,b)	2,124	19.32	Greenwood et al. 1971
Martha's Vineyard, MA	Feb. 1970	541 (a)	99	18.30	CSLP 1971

Table 6. (Continued.)

Area	Dates	Number of oiled dead birds	Number of dead Common Eiders	Percentage of Common Eiders	Source
E. coast Jutland, Denmark	Feb.-Mar. 1970	1,974 (a)	947	47.97	Joensen 1972b
Off eastern Canada	Feb.-Apr. 1970	1,276 (a,c)	559	43.81	Brown et al. 1973
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	1,713	74.12	Joensen 1972b
Djursland-Anholt, Denmark	Mar. 1971	239	19	7.95	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	683	14.35	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	4,413	48.22	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,b)	53	1.37	Gorski et al. 1976
Firth of Clyde, Ayrshire, Scotland	Jan. 1974	279 (a)	31	11.11	Lloyd et al. 1974
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,b)	8	1.23	Gorski et al. 1977
Varangerfjord, north Norway	Mar. 1979	1,616 (d)	14	0.87	Barrett 1979

(a) Total includes only those birds identified to species.
(b) Total includes some birds that were not oiled.
(c) Total includes both live and dead oiled birds.
(d) An estimated 10,000 to 20,000 seabirds were killed during this spill.

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KING EIDER

(Somateria spectabilis)

[DA: Kongeederfugl, DU: Koningseidereend, FI: Pulskahaahka, FR: Eider a tete grise, Eider royal; GE: Prachteiderente, IC: Aedarkongur, IT: Re degli Edredoni, NW: Praktaerfugl, PO: Turkan, RU: (Crested Eider), SP: Eider rey, Eider real; SW: Praktejder]

GENERAL DISTRIBUTION

King Eiders breed on the Arctic coast of Alaska from Point Hope, Tigara, and Cape Thompson eastward along the coasts of the Yukon, and the Mackenzie and Keewatin districts. They breed locally on the west coast of Hudson Bay to Cape Henrietta Maria, and South Twin Island, as well as on most of the Arctic islands (AOU 1957, Gabrielson and Lincoln 1959, Palmer 1976b). Breeding also occurs on most of the islands in the Franklin District, northward to northern Ellesmere Island and adjacent Greenland. Local breeding has been reported from northern coastal Quebec, and is suspected in Labrador (Godfrey 1966, Johnsgard 1978). In the winter, King Eiders occur throughout the eastern Aleutian Islands and the Alaskan Peninsula, as well as in northeastern North America from Greenland and Newfoundland south along the Maritime Provinces to the New England States (AOU 1957, Gabrielson and Lincoln 1959), with occasional records farther south and in the interior (Palmer 1976b).

The King Eider also breeds in the Palearctic region, including parts of Iceland, Spitzbergen, Novaya Zemlya and Vaigach islands, the eastern Kola Peninsula, and eastward to the Chuckchee Peninsula (AOU 1957, Palmer 1976b). In winter these birds occur in the North Atlantic, east to the Barents Sea and occasionally in the Baltic, and in the north Pacific to the Kurile Island and Okhotsk Sea regions (Palmer 1976b).

The King Eider occurs only as a vagrant in the southeastern United States. In North Carolina there are five records prior to 1937 (Simpson 1970) and five in the 1970's, all of one or a few birds. The three records from South Carolina include one bird seen inland (Sprunt and Chamberlain 1949, LeGrand 1979b). There are records of several occurrences in Georgia (Coolidge 1954, Burleigh 1958), three from the Gulf coast of Florida (Kale 1979 ms b), and one each from Alabama (Imhof 1976b) and Texas (Oberholser 1974).

SUSCEPTIBILITY TO OIL POLLUTION

There are few reports of King Eiders succumbing to oiling at sea, but as a diving sea-duck it is presumably highly vulnerable to oiling. King and Sanger (1979) regarded this eider as a species for which there should be high concern as to the effects of oiling in the northeast Pacific. However, King Eiders occur only casually in the southeast, and oil accidents there would pose no hazard to the species as a whole.

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HARLEQUIN DUCK

(Histrionicus histrionicus)

[DA: Stromand, DU: Harlekijneend, EN: Harlequin-Duck, FI: Virta-alli, FR: Garrot arlequin, Canard harlequin; GE: Kragenente, IC: Straumond, IT: Moretta arlecchino, JA: Shinorigamo, NW: Harlekinand, PO: Kaczka wzorzysta, Kamieniuszka; RU: (Stone Duck), SP: Pato arlequin, SW: Stromand]

GENERAL DISTRIBUTION

The Harlequin Duck breeds in two disjunct areas in North America. The eastern breeding range extends from the Ungava Bay area south along the coast of Labrador to the northern Gulf of St. Lawrence (AOU 1957, Bellrose 1976, Palmer 1976b). The breeding range in the west is much larger, extending from the Aleutian Islands and St. Lawrence Island to central Alaska, south through the Yukon Territory, British Columbia, the Olympic and Cascade mountains in Washington, and the Cascade and Wallowa mountains in Oregon to the western slopes of the Sierra Nevada in California and the northern Rocky Mountains of Montana, Idaho, and northern Wyoming (AOU 1957, Palmer 1976b). In the winter these ducks are found in the coastal portions of their breeding ranges along the Pacific as far south as coastal central California. The eastern birds winter from southern Labrador, Newfoundland, and Nova Scotia south along the Atlantic coast to Massachusetts, rarely to Long Island Sound, and casually to the Niagara River, Lake Erie, and Lake Ontario (AOU 1957). There are also reports of accidentals occurring farther south during winter.

Harlequin Ducks also breed in northern and eastern Asia from Lake Baikal and the Lena River, Siberia, east to northern Kamchatka and the Komandorskiye Islands, and south to northern Mongolia, Manchuria, and the Kurile Islands. In the winter they occur from Kamchatka, Manchuria, and the Aleutian and Pribilof islands south to Korea and southern Japan (AOU 1957). Harlequins also breed in Greenland and Iceland, often wintering along the southern coasts of both islands (AOU 1957).

The Harlequin Duck is a species of accidental occurrence in the southeastern United States. There were no records for North Carolina before 1961, but six records accumulated by 1967 (Parnell 1965, Carter 1968) and our studies show that there were five additional records by 1977. There are two early records for South Carolina (Sprunt and Chamberlain 1949) and three more recent records, 1975-77. Early records from Florida, primarily from the panhandle, are summarized by Williams (1968); six recent reports, 1971-77, from the Atlantic coast have come to our attention. There are three records for Alabama, only one of which is from the coast (Imhof 1976b); one very old record for Louisiana (Lowery 1974); and three sight records for coastal Texas (Oberholser 1974).

SUSCEPTIBILITY TO OIL POLLUTION

We have found no published accounts of oiled Harlequin Ducks, but the species should be considered highly vulnerable because of its preference for coastal waters during winter. However, the scarcity of the species in the southeast implies that no damage to the population would be done by oiling incidents in that area.

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OLDSQUAW

(Clangula hyemalis)

[DA: Haulit, DU: IJseend, EN: Long-tailed Duck, Sea Pintail; FI: Alli, FR: Canard de Miquelon, GE: Eisente, JA: Korigamo, NW: Hauelle, PO: Lodowka, RU: (Marine Duck), SP: Alfagel]

GENERAL DISTRIBUTION

North America In North America the Oldsquaw breeds in the Aleutian Islands and Arctic Alaska east across the Arctic coast of Canada to southeastern Labrador and the eastern panhandle of Quebec. It breeds north to northern Ellesmere Island and the coasts of Greenland and south to the northern and extreme western Yukon, northern and eastern Northwest Territories, northeastern Manitoba, the coast and islands of James and Hudson bays, and in northern Quebec (Godfrey 1966, Palmer 1976b).

The principal wintering grounds of the Oldsquaw in North America lie to the north of the southeastern states. Only in North Carolina is it common. In western North America, wintering Oldsquaw are found from St. Lawrence Island and the Aleutian Islands south along the Pacific coast to the Washington and Oregon border, occasionally to southern California (AOU 1957, Palmer 1976b); most winter in the Bering Sea (Bellrose 1976). Along the Atlantic seaboard, Oldsquaws are found from southern Greenland, Labrador, and Newfoundland, south to Chesapeake Bay, and rarely to Florida (AOU 1957, Palmer 1976b). In this area the largest concentrations found in 1972 occurred from Delaware Bay to the lower Chesapeake Bay (Bellrose 1976). Small numbers winter along the Gulf coast; there, the species is apparently most abundant in the northern Gulf. Oldsquaws also winter in the interior of North America, chiefly on the Great Lakes, and irregularly on other lakes and rivers south to Colorado, Utah, Texas, Kentucky, and Tennessee (AOU 1957).

World Distribution In the Old World, this duck breeds in the northern Palearctic from Iceland, Spitsbergen, and Scandinavia to the tundra of Russia and Siberia, and on the islands of the Bering Sea (BOU 1971). In eastern Eurasia, the Oldsquaw breeds south to about 60° N in the interior of the Scandinavian peninsula. Some breed at about this latitude in southern Finland but most of the breeding population occurs north of 65° N (Cramp et al. 1977).

Wintering Oldsquaw in the Old World are found largely at sea and occur in the breeding range south to northern France and the Baltic, Caspian, and Black seas (AOU 1957, BOU 1971, Cramp et al. 1977). In Asia these ducks winter south to Japan and Korea, largely in coastal areas (Vaurie 1965, Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina According to Pearson et al. (1942) and Wray and Davis (1959), the Oldsquaw is a common winter resident in North Carolina, found mostly in coastal bays and sounds. They may also occasionally be seen inland. Potter et al. (1980) considered them uncommon to rare inland, and indicated that most occur in the state from November to April. Oldsquaws in breeding plumage observed along the coast during the summer are probably injured birds unable to fly north.

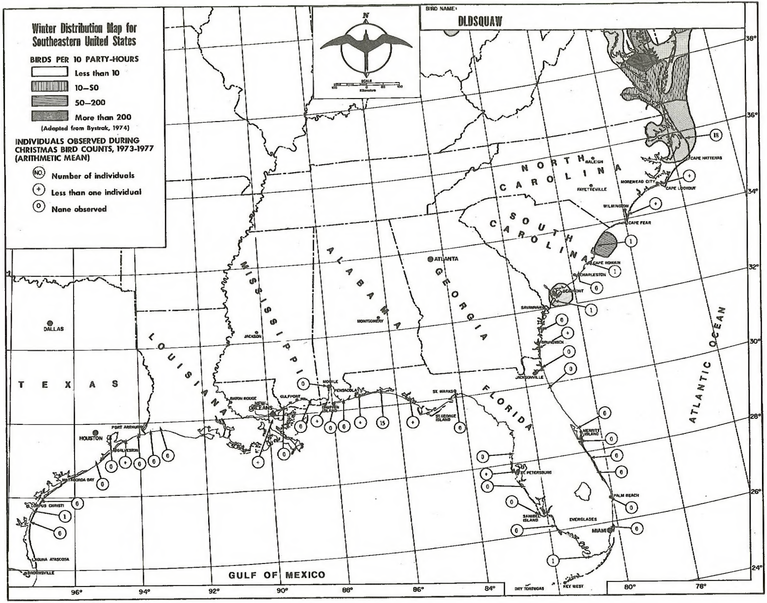
South Carolina Sprunt and Chamberlain (1949) regarded the Oldsquaw as an uncommon winter resident that occurs in varying numbers nearly every year, primarily along the coast. They mostly occur on the ocean and in larger bays. One may occasionally be found in freshwater habitats such as rice fields and the backwaters of cypress swamps. Potter et al. (1980) recently stated that the Oldsquaw is rare in South Carolina. This status is also suggested by recent Christmas Counts (Map 24).

Georgia Burleigh (1958) listed the Oldsquaw as an uncommon winter resident throughout the state. They are most frequently seen as individuals along the coast during late winter and early spring, and are usually females. Denton et al. (1977) considered the species uncommon and irregular in Georgia.

Florida Howell (1932) considered the Oldsquaw a rare winter visitor in Florida. Kale (1979 ms a) also reported that they are rare, and noted that a few birds are seen each winter in Atlantic coastal waters. In recent years, Oldsquaws have been reported more frequently on both the Atlantic and Gulf coasts (Kale 1979 ms a, 1979 ms b). Observations reported in American Birds during the last ten years give dates of occurrence for the Atlantic coast ranging from 5 December (at Merritt Island NWR; Stevenson 1977) to 28 March (38 mi, or 61 km off Melbourne; Stevenson 1976). One atypical bird remained in the Indian River near Cocoa until mid-May (Kale 1972). The range of dates listed for the Gulf coast is from 7 November (Edscorn 1977) to 21 April (Kale 1978), both at Tampa.

Alabama The Oldsquaw is an uncommon but regular winter resident along the Gulf coast of Alabama. Bon Secour and Mobile Bay also harbor small numbers. It is seldom seen inland but occurs fairly frequently in and near Wheeler NWR (Imhof 1976b). Oldsquaws have been reported along the coast from November to April. A maximum of 65 was counted at Fort Morgan 9 January 1961. Other particularly large flocks seen include 30 birds at Dauphin Island, 7 April 1971, and 50 inland at Lake Purdy, 16 January 1971 (Imhof 1976b).

Mississippi Burleigh (1944) considered the Oldsquaw at least a casual visitor along the Gulf coast of Mississippi in late winter and spring. Recent observations show that the species is now more common in Mississippi than Burleigh suggested. In Mississippi, the Oldsquaw is most abundant in the Gulf. As many as 85 were seen at West Ship Island, 24-28 February 1979 (Hamilton 1979), and 40 were seen there in March 1977 (Weber and Jackson 1977). Up to 16 were present at Horn Island in January and February 1978, and another 20 were present at East Ship Island the latter month (Hamilton 1978). Another 15 were seen off Biloxi in the Gulf of Mexico, 20-21 February 1976 (Hamilton 1976). Inland records are few, but as many as 25 have been seen at Sardis Lake (Hamilton 1971). Dates of occurrence given in the last ten years of American Birds show that Oldsquaw may be present in Alabama from 20 December (Hamilton 1971) through 21 April (Imhof 1979).


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10—50
50—200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
BIRD NAME:
OLDSQUAW
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
JACKSON
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
PALM BEACH
MERRITT ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
CAPE LOOKOUT
MOREHEAD CITY
FAYETTEVILLE
RALEIGH
CAPE HATTERAS
DRY TORTUGAS
KEY WEST
18
15
1
0
+
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 24

Louisiana Formerly regarded as only a casual winter visitor to Louisiana (Oberholser 1938), the Oldsquaw is now regarded as a rare to uncommon winter visitor (Lowery 1974). The number seen has increased markedly in the last few decades. Many of the records are from inland, despite the birds' decided preference for salt water (Lowery 1974).

We found about six records for Oldsquaws in Lousiana listed in American Birds, 1970-1979. The localities where they were seen were Lake Pontchartrain, Holly Beach, Natchitoches, Baton Rouge, and on the Calcasieu River near Cameron (Hamilton 1971, 1974, 1975, 1976; Purrington 1973b). The species has been recorded in Louisiana between 15 November and 3 May (Lowery 1974).

Texas The Oldsquaw is a rare and irregular visitor to Texas during the winter, most common in the northern third of the state and on the Gulf coast (Oberholser 1974). At least 16 records of about 24 birds were reported from Texas in American Birds from 1970-1979. The majority of these records were from the coast and consisted of sightings of individual birds. The most reported at once were five seen off High Island, 27 February 1977 (Webster 1977). A majority of the records fell between November and January; Oberholser (1974) listed dates of occurrence for the state as 19 October to 30 May.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Oldsquaw nests in the arctic and subarctic regions of the Holarctic and is one of the northernmost of ducks in its breeding distribution. Oldsquaws breed circumpolarly with no major gaps in their distribution. In the New World they regularly breed south to Davis Inlet in Labrador (Bellrose 1976); in the Old World, Oldsquaws breed south to southern Finland (Cramp et al. 1977), northeastern Kamchatka, and the Komandorskiye Islands (Vaurie 1965).

The total number of Oldsquaws is unknown, but Johnsgard (1978) speculated that the worldwide population is about 10,000,000 birds. Bellrose (1976) estimated that the early summer population of Oldsquaws in North America was 3,000,000 to 4,000,000. In the Old World, the Oldsquaw is the most abundant duck far north in the western Palearctic (Cramp et al. 1977). The total breeding population in Eurasia is unknown, but authors cited in Cramp et al. (1977) suggest populations of ca. 2,076,000 in the U.S.S.R.; 200,000 to 600,000 in Iceland; and 1,000 in Finland.

Winter Most North American Oldsquaws winter in the Bering Sea; others winter south along the Pacific coast to Washington, occasionally to southern California. Bellrose (1976) indicated that more than 1,200,000 winter in the area from St. Lawrence Island and the Aleutians to the Alaskan peninsula. More than 20,000 Oldsquaws winter in the interior on the Great Lakes (Bellrose 1976), and lesser numbers may be found on other bodies of water in the interior.

Relatively small numbers winter along the Atlantic coast from southern Greenland and Newfoundland to South Carolina and Georgia. They also occur irregularly or in small numbers in Florida and the Gulf Coast States. Bellrose (1976) reported that 11,800 Oldsquaws were seen between the coast of New Jersey and the lower Chesapeake Bay in 1972. This figure represents more than half of all Oldsquaws seen on Audubon Christmas Counts along the Atlantic coast that year. Along the Gulf coast Oldsquaws are most abundant from the Florida panhandle to eastern Louisiana (Map 24).

The Audubon counts provided by Bellrose (1976) suggest that much smaller numbers of Oldsquaws winter along the Pacific coast than along the Atlantic. On the 1975 January waterfowl survey (Goldsberry et al. 1980), only 432 Oldsquaws were reported along the Pacific coast, compared to 11,966 seen along the Atlantic Seaboard. Slightly over half this many (6,800) were seen in Wisconsin and Michigan.

Eurasian Oldsquaws winter throughout most of their breeding area--the southern Scandinavian peninsula, the Baltic States and adjacent parts of the U.S.S.R.--south to the British Isles, northern France, the Netherlands, Belgium, and the Black Sea. In Asia they winter south, largely in coastal areas, to Japan and Korea. There are no overall population figures for birds wintering in the Old World. Cramp et al. (1977) reported a provisional estimate of no more than 500,000 wintering in western Europe in recent years. They suggested that the disparity between this estimate and estimates for breeding and migrant birds was the result of the latter being wrong or that there were massive concentrations of Oldsquaws wintering in unknown areas.

Cramp et al. (1977) suggested that Oldsquaw populations in the Old World may have declined due to oil pollution. Palmer (1976b) believes that North American populations are undiminished from earlier times.

Migration Information on the migration of North American Oldsquaws is so poor that Bellrose (1976) was unable to provide a map showing their migratory pathways. He suggested, however, that their migration paralleled the coast when breeding and wintering areas were near salt water and that birds found in the interior and on the Great Lakes migrated overland. This may also be true for birds wintering on the northern Gulf coast.

The fall migration of the Oldsquaw is late compared with the migrations of other species. Some may remain on the northern breeding grounds until early September. Long-distance flights overland usually occur after mid-October. Oldsquaws wintering on the southeastern Atlantic coast begin arriving by the last third of October, with others arriving past mid-December (Palmer 1976b). Males apparently migrate a shorter distance than females (Palmer 1976b). Consequently, one may expect most of the birds in southeastern waters to be females.

Oldsquaws in the southern portions of their winter range in the United States migrate earlier in spring than those wintering farther north (Palmer 1976b). Most of the Oldsquaws wintering in the Chesapeake Bay, just to the north of North Carolina, depart between mid-March and mid-April; peak numbers arrive there in the fall between early November and early December (Bellrose 1976).

Cramp et. al. (1977) indicated that some populations of Eurasian Oldsquaws are migratory and that others are partially migratory (i.e., some birds migrate to other areas to spend the winter and others remain to winter in waters near the breeding area). Migratory pathways are poorly known, but the timing of migration appears similar to that of North American birds.

HABITAT

Nesting Oldsquaws largely breed on high-Arctic tundra and are often the most abundant nesting ducks there (Cramp et al. 1977). They usually nest on treeless or nearly treeless islands in large lakes or ponds, and on coastal islands (Bellrose 1976, Palmer 1976b). Others nest in upland areas near tundra ponds (Bellrose 1976). Cramp et al. (1977) reported similar nesting habitat for Oldsquaws breeding in the western Palearctic. Nest sites are usually near water and are often partially hidden beneath shrubs or among sedges, or in crevices between rocks (Palmer 1976b).

Alison (1975a) did an intensive study of Oldsquaw breeding biology near Churchill, Manitoba. Alison reported that 59% of 95 nests were located in islands in freshwater ponds or lakes. Most of the rest of the nests (24.3%) were on mainland ponds; 9.5% were in marshy areas, 4.2% were in scrubland, and 2.1% were in dry upland. Black Spruce (*Picea mariana*) boughs concealed 27.3% of the nests from above; these nests were well concealed from the side by grasses, dwarf willows (*Salix* spp.), or dwarf birches (*Betula* spp.). Most of the nests (64.1%) were open from above but well-concealed from the side; the rest were partially or poorly concealed. Nests found on the mainland were significantly better concealed than those found on islands. About 65% of all active nests were within 1.4 m (4.6 ft) of open water, and only 10% were further than 14 m (46 ft) from water (Alison 1975a).

Feeding Oldsquaws apparently prefer to feed in marine waters even during the breeding season. At other times of year they feed in open ocean, deep lakes, salt and brackish bays, and occasionally in freshwater estuaries (Johnsgard 1978). Alison (1972 *in* Bellrose 1976) reported that Oldsquaws fed in water 30-50 ft (9-15 m) deep near Toronto; in Lake Ontario, they were seen feeding in water 3-32 ft (0.9-9.8 m) deep (Bellrose 1976). Johnsgard (1975) suggested that the foraging depth over sub-tidal feeding areas in coastal areas is no more than 25 ft (7.6 m), and Palmer (1976b) remarked that they probably commonly dive to depths of 10 fathoms (18 m). Cramp et al. (1977) stated that normal foraging depths are 3-10 m (10-33 ft).

Winter and Offshore Wintering Oldsquaw are found both on open water inland and off the coast, but most are found along coasts. They are one of the most pelagic ducks and are often found far from shore. Palmer (1976b) indicated that wintering birds seldom or never left the water. Birds wintering on fresh water are generally well out in the open; those wintering on the Great Lakes are usually 7-10 mi (11-16 km) or more from shore (Palmer 1976b).

FOOD AND FEEDING BEHAVIOR

Oldsquaws feed by diving, sometimes to great depths. Bellrose (1976) suggested that foraging Oldsquaws dive deeper than any other duck. Alison (1975a) examined Oldsquaws caught in gill nets at a depth of 51 m (167 ft); Palmer (1976b) believed that a dive of 34 fathoms (62 m) was the deepest dive that had been adequately documented.

Little information is available on feeding techniques but these ducks probably employ a variety of methods to obtain food (Palmer 1976b). Submergence times are long; Cramp et al. (1977) cited studies giving the range of time that Oldsquaws remained below the surface as 30-40 sec, 30-60 sec, and 22-61 sec. Birds in flocks may dive in synchrony (Palmer 1976b) or they may dive one after the other in a long line (Cramp et al. 1977). Oldsquaws usually feed by day, but they may also feed nocturnally (Millais 1913 in Cramp et al. 1977). Wintering birds move inshore to feed, then out to roost. The timing of such movements varies widely with a number of environmental factors (Palmer 1976b).

Peterson and Ellarson (1977) recently studied the food habits of the Oldsquaw on Lake Michigan and concluded that animal matter comprises most of the diet. They also concluded that the Oldsquaw is an opportunistic feeder that eats any food which is sufficiently numerous or readily available. Most of this food is living animals, but Oldsquaws have also been known to dive for discarded offal (Peterson and Ellarson 1977) and to feed on long-dead fish.

Crustaceans and molluscs are often principal components of the diet. Oldsquaws collected on Lake Michigan from 1951 to 1954 had eaten 99% (by volume) animal food. Most of it (52-96%, depending on the sample area) consisted of a single amphipod (Pontoporeia affinis). This animal was also an important item of diet in a large sample of Oldsquaws collected on Lake Michigan from 1969 to 1972. During the latter period this amphipod was present in 95% of all Oldsquaw gullets that contained any food (Peterson and Ellarson 1977). Rofritz (1977) found that all the identifiable stomach contents from Oldsquaws collected in the Milwaukee harbor consisted of oligochaete sludge worms (Tubifex tubifex and Limnodrilus hoffmeisteri). Studies cited in Palmer (1976b) and Bellrose (1976) suggest a proportion of animal food ranging from 88 to 100% of the diet.

Other animals eaten include a variety of molluscs (e.g., snails, cockles, clams, chitons), crustaceans (e.g., isopods, amphipods, shrimp, crabs), various insects (mostly aquatic forms), fish (e.g., gobies, cod, flatfish, minnows), fish eggs (e.g., stickleback, herring), echinoderms, and annelids (e.g., earthworms, cutworms)(authors cited in Bellrose 1976, Palmer 1976b, Cramp et al. 1977, Peterson and Ellarson 1977).

The small amount of plant material eaten includes such items as pondweeds, various parts of sedges and grasses, filamentous algae, moss, berries, tubers, roots, and leaves (Palmer 1976b, Cramp et al. 1977).

We have found no reports of food habits of the Oldsquaw in southeastern waters aside from an occasional anecdotal remark in the distributional literature. More extensive reviews of foods eaten by Oldsquaws are provided by Johnsgard (1975), Bellrose (1976), Palmer (1976b), Cramp et al. (1977), and Peterson and Ellarson (1977).

SUSCEPTIBILITY TO OIL POLLUTION

The Oldsquaw is a frequent victim of oil pollution and is known to have suffered heavy casualties from oil in both the New and Old Worlds (Table 7). Cramp et al. (1977) considered the Oldsquaw unusually susceptible to oil pollution and suggested that the Old World population may have greatly declined from this source of mortality. Perry et al. (1979) estimated that a total of more than 15,000 Oldsquaws died following two oil spills in the Chesapeake Bay in 1976 and 1978. The Oldsquaw was the principal victim of the 1978 spill, and in 1976 more Oldsquaws died than any other species except the Horned Grebe.

We consider the Oldsquaw one of the species most susceptible to oiling of any species that occurs in southeastern waters. Individual Oldsquaws would probably be affected by oil in the event of oil discharges or spills off the southeastern coasts of the United States. However, only a fraction of one percent of the North American population, let alone of the world population, winters there. Consequently, we believe that oil spills and other effects of petroleum development would have essentially no effect on the overall Oldsquaw population.

Table 7. Number of dead birds and number and percentage of dead Oldsquaws found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Old-squaws	Percent-age of Oldsquaws	Source
North Sea coast, Denmark	1957-1958	92 (a)	3	3.26	Joensen 1972a
North-central Kattegat, Denmark	Jan.-Feb. 1962	1,723 (a,b)	69	4.00	Joensen 1972a
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	17	0.73	Joensen 1972a
Bornholm, Denmark	Jan.-Feb. 1966	466 (a)	308	66.09	Joensen 1972a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (c)	1	0.09	Greenwood and Keddie 1968
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	35	1.47	Joensen 1972b
Laeso-Vendsyssel, Denmark	Dec. 1969	1,362	2	0.15	Joensen 1972b
Northeast Britain	Jan.-Feb. 1970	10,992 (a,b)	35	0.32	Greenwood et al. 1971

Table 7. (Continued.)

Area	Dates	Number of oiled dead birds	Number of dead Old-squaws	Percent-age of Oldsquaws	Source
Martha's Vineyard, MA	Feb. 1970	541 (a)	3	0.55	CSLP 1971
E. coast Jutland, Denmark	Feb.-Mar. 1970	1,974 (a)	26	1.32	Joensen 1972b
Off eastern Canada	Feb.-Apr. 1970	1,276 (a,c)	192	15.05	Brown et al. 1973
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	6	0.26	Joensen 1972b
Djursland-Anholt, Denmark	Mar. 1971	239	4	1.67	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	63	1.32	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	11	0.12	Joensen and Hansen 1977
Baltic sea coast, Poland	1972-1974	3,867 (a,b)	2,565	66.33	Gorski et al. 1976
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,c)	313	47.93	Gorski et al. 1977
Chesapeake Bay, Virginia	Feb. 1976	30,000 (d)	11,900	39.67	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (d)	3,890	38.90	Perry et al. 1979
Varangerfjord, north Norway	Mar. 1979	1,616 (e)	3	0.19	Barrett 1979

(a) Total includes only those birds identified to species.
(b) Total includes some birds that were not oiled.
(c) Total includes both live and dead oiled birds.
(d) Figure is an estimate based on counts of dead birds.
(e) An estimated 10,000 to 20,000 seabirds died as a result of this oil spill.

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BLACK SCOTER

(Melanitta nigra)

[DA: Sortand, DU: Zwarte Zee-eend, EN: Common Scoter, FI: Meriteeri, FR: Macreuse noire, GE: Trauerente, IC: Hrafnsond, IT: Orchetto marino, JA: Kurogamo, NW: Svartand, PO: Markaczka czarna, PR: Pato-do-mar, Pato negro; RU: (Scoter), SP: Anade negro comun, Negron comun; SW: Sjoorre, US: American Scoter]

GENERAL DISTRIBUTION

North America The Black Scoter breeds in coastal interior Alaska from Bristol Bay north to Kotzebue Sound and Mount McKinley. There is a small breeding population in central Ungava and there are a few scattered breeding records from Newfoundland, northern Quebec, and southern Keewatin District (Godfrey 1966). Details of the breeding range are not clear (Johnsgard 1975, Bellrose 1976, Palmer 1976b), in part because summer birds do not necessarily nest.

In winter Black Scoters are found in the Great Lakes region and along the Atlantic and Pacific coasts. Along the Pacific coast they range from the Aleutian Islands south to northern Baja California (Palmer 1976b), but are apparently most abundant in the Aleutian Islands and on the Alaska Peninsula (Johnsgard 1975, Palmer 1976b). Black Scoters commonly winter from Newfoundland to the Carolinas (Johnsgard 1975, Bellrose 1976); they also winter, in small numbers, off the Atlantic coast of Florida and off the coast of states bordering the Gulf of Mexico (Map 25).

World Distribution The American race (M. n. americana) also breeds in northern Asia from the Lena-Yana watershed to the Anadyr Basin and the Kamchatka Peninsula and on the Kurile Islands. The European Black Scoter (M. n. nigra) breeds in Iceland, Scotland, Norway, and northern Eurasia at least to the Khatanga River (Johnsgard 1978). It has occurred in North America only as a straggler to Greenland (Palmer 1976b). European Black Scoters winter primarily off the coasts of western Europe and on the Mediterranean, Black, and Caspian seas (Johnsgard 1978), but are also found off the coasts of northwest Africa. Birds of the American race winter along the Asian coast south along the Kamchatka Peninsula to Korea, Japan, and eastern China (Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

The record of observations of the Black Scoter in the southeast shows a dramatic change in either the winter distribution and abundance of the species or the pattern of observation and reporting. The typical winter distribution of the northern sea ducks--large concentrations off the northeastern coast,

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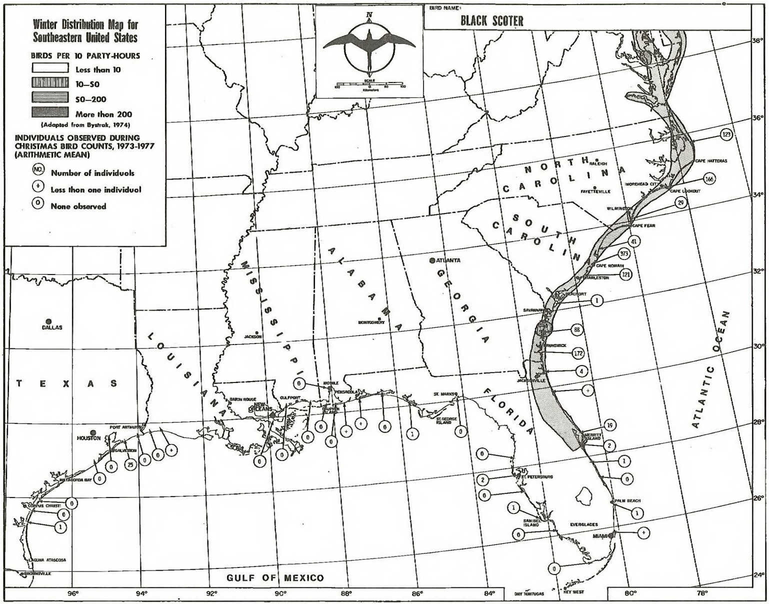
Taxonomic note: The Fifth Edition of the AOU Check-list (1957) lists this species as the Common Scoter, Oidemia nigra. Many older references use the specific name americana.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10—50
50—200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
BIRD NAME:
BLACK SCOTER
N
SCALE
Kilometers
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
MERRITT ISLAND
PALM BEACH
MIAMI
EVERGLADES
KEY WEST
DRY TORTUGAS
SANIBEL ISLAND
ST. PETERSBURG
ST. GEORGE ISLAND
ST. MARKS
PENSACOLA
MOBILE
DAUPHIN ISLAND
GULFPORT
NEW ORLEANS
BATON ROUGE
JACKSON
MONTGOMERY
ATLANTA
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
123
166
29
41
373
121
1
88
172
4
+
19
2
1
0
1
+
0
2
0
1
0
0
1
0
+
+
0
0
0
0
0
0
0
+
0
25
0
0
0
1
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 25

perhaps to Chesapeake Bay, with numbers and observations dwindling rapidly southward--was apparently appropriate for this species through the early part of the century. More recent observations, however, indicate large concentrations of Black Scoters off South Carolina and Georgia, but not off either North Carolina or Florida. Unfortunately, the records are not sufficiently consistent to reveal whether these concentrations occur every year, in a cyclic fashion, or just sporadically. Stott and Olson (1972) postulated that changed distributional patterns of all three scoters might have resulted from changes in hunting pressure off the northern coast, but if the more southerly occurrences are cyclic or sporadic the lack of intense observation in the past may merely obscure the fact that this is actually a historic pattern. At any rate, the pattern is unusual enough to warrant examination in some detail.

This species generally remains well offshore, where it might easily escape detection by observers on the coast. Many records from the southeast are of birds in late spring or summer, possibly crippled birds that cannot migrate back to their breeding grounds and that drift shoreward after flocks depart.

North Carolina Pearson et al. (1919) considered the Black Scoter "a common winter species in Pamlico and Core sounds..." but more numerous on the ocean; no specific records were given. Later, Pearson et al. (1942) reported the species as "occasional", noting observations dating from 1871, 1919, 1924, and 1934. These records may have been selected to show seasonal or numerical status, and the degree to which they represent total observations is unclear. Wray and Davis (1959) reported at least nine additional observations, but failed to suggest any change from the "occasional" status reported earlier. The only recent reports (Teulings 1976d, 1977b; LeGrand 1977b) are of birds that lingered into the summer or that appeared inland, and the literature for the last two decades is silent on the overall status of the species.

South Carolina There were only two records of the Black Scoter in this state until 1929, represented by specimens taken in 1884 and 1903. Eight birds were seen in January 1929. "Since then, records have multiplied, and the species is now listed as a regular winter visitor. It is, indeed, the most common of the scoters frequenting the South Carolina coast" (Sprunt and Chamberlain 1949). Although there are few published records since 1949, Burton (1970) said that "This species is by far the earliest of the sea-ducks to arrive in numbers off the South Carolina coast...". The species is seldom mentioned as occurring in South Carolina waters during the 1970's in any of the seasonal reports in American Birds except on Christmas Bird Counts, when it is generally reported in small numbers (Map 25).

Georgia Greene et al. (1945) reported a single occurrence of the Black Scoter in Georgia, dating from 1903 (the same year as an early South Carolina record). Tomkins (1955) reported three additional occurrences, of single birds, in and about 1955; these records are overlooked by Burleigh (1958), who mentioned only the 1903 specimen. There must have been a very sudden change in the next decade--Stott and Olson (1972) cited observations by O. Dewberry of "10,000-30,000 [Black] scoters using the open coast during the winters of 1968-70....". Coolidge (1974) reported two flocks of 108 and 55 Black Scoters in October 1974, and commented that before 1960 the species "...was considered a rare winter visitor to our state. Since that time it has been seen so frequently that it no longer has that status and we now expect it as a mid-winter visitor off-shore and in our sounds". The most recent analysis (Denton et al. 1977), on the other hand, considers the Black Scoter uncommon in winter and occasional in other seasons.

Florida Through the year 1925 there were only about seven records, all from the east coast (Howell 1932). Sprunt (1954) summarized four Gulf coast records, and noted that a high proportion of all Florida records were in the spring or early summer. At present, the Black Scoter is considered rare to uncommon on both coasts of Florida, although regular in the Upper Gulf, and observations are occurring with greater frequency than in the past (Kale 1979 ms a, 1979 ms b).

Alabama Black Scoters are rare to casual visitors on the Alabama coast, occurring most frequently in Mississippi Sound. They have been recorded between November and April, and one was observed in the vicinity of Dauphin Island during the summer of 1970 (Imhof 1976b).

Mississippi The status of Black Scoters in Mississippi is imperfectly known; they are evidently uncommon or rare. Jackson and Weber (1977) and Weber and Jackson (1977) listed recent sightings of three inland on Sardis Lake from early November through 22 December 1976, and of eight on the coast at East Ship Island, 10 March 1977.

Louisiana The Black Scoter is uncommon in Louisiana waters but has become more common in recent years. There were only five records through 1960 but by 1973 the species had been recorded 19 times, with a total of 120 birds. Dates of occurrence through this period range from 25 October through 25 May, with no clear pattern of distribution (Lowery 1974). Most of the records were from the coast.

Texas Oberholser (1974) considered this duck a rare and irregular winter visitor. It is chiefly coastal in its distribution but there are several inland records. According to Palmer (1976b), it was once the rarest scoter on the coast but is now the most common. Dates of occurrence given by Oberholser (1974) are from 4 November to 21 April.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The breeding distribution of the Black Scoter is not well known but most of the breeding population is found between 75° N and 50° N latitude and in the northern Palearctic and northwestern Nearctic. In the Old World it breeds in Iceland, the Faeroes, and through Scandinavia to the Taimyr Peninsula. Another population breeds in northeastern Siberia (BOU 1971). The primary breeding population within North America is in northwestern Alaska, with smaller numbers breeding in Ungava (Palmer 1976b). Few breeding records are available for Canada, but Bellrose (1976) suggested the possibility of a large breeding population west of James Bay.

The numbers of Black Scoters breeding in North America are not known adequately. Bellrose (1976) stated that most of the 252,000 scoters found in

Alaska during aerial surveys were Black Scoters. Of these, most (157,000) breed on the Yukon Delta. Another 75,000 breed adjacent to Bristol Bay and some 20,000 breed on the Seward Peninsula (King and Lensink 1971 in Bellrose 1976). The 1976 survey of waterfowl nesting in Alaska found a breeding population of 376,200 scoters (Larned et al. 1980). Information on the size of many Old World breeding populations is lacking but this scoter is apparently considerably less abundant in the western Palearctic than in the northwest Pacific. Cramp et al. (1977) cited authors listing breeding populations of 1,000 in Iceland and Finland and about 60 in Britain.

Winter The Black Scoter winters on the Asian and North American coastlines of the Pacific Ocean, in the Great Lakes, and on the Atlantic coast south to about the Carolinas and irregularly to Florida and the Gulf States (Map 25) (AOU 1957, Johnsgard 1975). European birds winter mainly off the coast of Western Europe, and on the Black, Mediterranean, and Caspian seas (Johnsgard 1978).

Because winter surveys of waterfowl by the U.S. Fish and Wildlife Service do not distinguish between species of scoter, the distribution and numbers of birds wintering within the United States is poorly known. Bellrose (1976) was puzzled at the small numbers wintering on the Pacific coast and reported an estimated 250,000 wintering in the Aleutian Islands. During the January 1976 waterfowl survey (Larned et al. 1980), totals of about 97,000 scoters were found in the Pacific Flyway and about 60,000 in the Atlantic Flyway. Bellrose (1976) suggested that about 3% of the birds wintering in the Pacific Flyway were Black Scoters and that this species constituted 20% of the scoters wintering along Atlantic coasts. If these figures are still applicable, approximately 2,900 Black Scoters winter off the Pacific coasts of the contiguous United States, with another 15,000 wintering off the Atlantic coasts.

The number of Common Scoters wintering in the Old World is also uncertain but Cramp et al. (1977) listed an estimate of 400,000 to 500,000 wintering in the western Palearctic.

Migration Migration of Black Scoters is poorly known and recent handbooks (Bellrose 1976, Palmer 1976b) are frankly speculative in describing possible migratory routes. We would rather not add to these speculations until more and better information is obtained on the distribution and size of wintering and breeding populations. Judging from the information available, Black Scoters usually begin to arrive in southeastern waters in early November and have largely departed by late April.

Much of the information available on habitats, food habits and breeding biology of the Black Scoter is from studies made in the Old World. Consequently, much of what is presented in the following sections is largely a summary of information given by Cramp et al. (1977), supplemented by information in other recent handbooks. Presumably much of the data given by Cramp et al. (1977) is generally applicable to North American populations of the Black Scoter.

HABITAT

Nesting Most Black Scoters nest well inland in tundra or dwarf heath.

When nesting in wetter, more open sites, they prefer to nest on islets and low promontories. Black Scoters will also nest on upland slopes, arctic-alpine areas, and along the banks of rivers (Cramp et al. 1977).

At Lake Myvatn, Iceland, these ducks nested predominantly under dense shrubbery, primarily low rather than high shrubs. They nested to a much lesser extent in holes, meadows, and among sedges. Most nests were within 10-100 ft (3-30 m) of potholes and were well dispersed. The average nest-density was 53 nests/sq km (1 nest/5 acres [Bengtson 1970 in Johnsgard 1975, Bellrose 1976]). Black Scoters nested in the largest clumps of grass at Hooper Bay, Alaska (Brandt 1943 in Bellrose 1976).

Feeding Breeding birds presumably feed in waters near their nest sites; wintering birds largely feed over shellfish beds in shallow waters. Cramp et al. (1977) indicated that these scoters prefer to feed in waters about 1-3 m (3.3-9.8 ft) deep.

Winter and Offshore Non-breeding Black Scoters often form large flocks comprised of several hundred to a thousand or more birds. These scoters are usually found on marine waters, generally 500 m (1,640 ft) to 2 km (3.22 mi) offshore over waters not more than 10-20 m (32.8-65.6 ft) deep. They prefer open ocean just offshore to areas interspersed with rocks and islands (Cramp et al. 1977). Johnsgard (1975) indicated that the optimum habitat along the Atlantic coast was within a mile (ca. 1.6 km) of shore and just beyond the breakers. During stormy weather Black Scoters sometimes seek sheltered waters (Palmer 1976b). They rarely come ashore but may occasionally rest on islets or sandbanks (Cramp et al. 1977).

FOOD AND FEEDING BEHAVIOR

Black Scoters feed by diving, usually by day in smaller scattered groups than when roosting nocturnally (Cramp et al. 1977). They usually move inshore to feed early in the morning (Phillips 1926 in Johnsgard 1975). Diving is often synchronized (Cramp et al. 1977). These scoters do not dive particularly deeply; Cottam (1939 in Johnsgard 1978) believed that dives seldom exceeded 40 ft (12 m). Cramp et al. (1977) indicated that these scoters may remain submerged for as much as 49 sec but that dives usually take between 18 and 30 sec.

We are unaware of any detailed accounts of food habits within the waters of the southeastern United States. The following comments on foods eaten elsewhere are largely abstracted from Palmer (1976b) and Cramp et al. (1977), who should be consulted for more detailed listings of organisms eaten.

In one study covering North America (Cottam 1939 in Palmer 1976b), Black Scoters fed largely (ca. 90%) on animals. Much of the diet consisted of molluscs (e.g., mussels, cockles, clams, snails, scallops) and crustaceans (e.g., amphipods, crabs, barnacles, crayfish, shrimp). Fishes and their eggs, insects, frogs and tadpoles, echinoderms (e.g., sand dollars, sea urchins, starfish, brittle stars) and annelids are also eaten. Inland, freshwater clams are preferred. Vegetable foods eaten in North America are largely pondweeds, including *Zostera*, *Potamogeton*, and *Ruppia*, as well as various algae.

Black Scoters in the Old World have food habits similar to those of North American birds and often feed largely on molluscs. In Iceland, young birds ate mostly aquatic insects and seeds; females mostly ate chironomid larvae and a few adult males ate mostly fish eggs and some chironomid larvae (Bengtson 1971). A number of studies have shown that Blue Mussels (Mytilus edulis) are often an important food item in both North America and in the Old World.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying The Black Scoter Duck is the last to nest in the Yukon Delta. There, it lays its eggs about the middle of June (Bellrose 1976). Palmer (1976b) indicated that Black Scoters may complete their clutches as early as May in Iceland and that full clutches are commonly present by early June in Iceland and Great Britain.

Mean Clutch Size Clutches range from about 5 to 8 eggs in Alaska and the British Isles, but apparently are larger in Iceland (Bellrose 1976). Palmer (1976b) indicated that the usual clutch size is 7-8 eggs and considered 6-10 the normal range. The mean of mean clutch sizes for the period 1961-1970 at Lake Myvatyn, Iceland, was 8.7; early nests contained a mean of 8.9 eggs and late nests a mean of 8.1 eggs. Nests considered to be the result of renesting contained a mean of 6.1 eggs (Bengtson 1972).

Incubation Period No information is available on the incubation period of North American Black Scoters. Incubation periods ranging from 26 to 33 days have been reported for Old World Black Scoters (Palmer 1976b).

Hatching Success For Black Scoters nesting at Lake Myvatyn, Bengtson (1972) indicated that 95.2% of the eggs hatched in nests in which any eggs hatched at all. Bengston estimated a hatching success for Black Scoters of 81.8%. Cramp et al. (1977) reported that eggs hatched in 16 of 38 nests in Ireland. There appear to be no adequate data on hatching success for North American Black Scoters.

Fledging Success No exact information is available. Bengston (1972) estimated that a mean of 2.7 young were produced per female at Lake Myvatn, Iceland.

Age at Fledging Palmer (1976b) commented that the age of first flight (6-7 weeks) reported by Hantzsch (1905 in Palmer 1976b) was only an estimate; Palmer believed that the true age of first flight was greater. Cramp et al. (1977) reported that fledging and independence occur at 45-50 days but they did not indicate the source of their information.

Age at First Breeding European birds first nest at two years of age (Dement'ev and Gladkov 1967 in Bellrose 1976). American birds probably do the same (Palmer 1976b). Cramp et al. (1977) stated that age at first breeding is 2-3 years.

Mortality of Eggs and Young Cramp et al. (1977) reported that egg predation by Hooded Crows (Corvus corone) and Magpies (Pica pica) was the main cause of egg loss for Black Scoters nesting in Ireland. In 109 nests at Lake Myvatn, Iceland, in which at least one egg hatched, 86% of the remaining eggs were infertile and 3% contained dead embryos (Bengtson 1972). Bengtson ascribed egg loss in 19 nests that failed to hatch eggs to predation (58%), desertion (32%), and flooding (11%). He believed that Raven (Corvus corax) predation was the most important cause of nest failure at Lake Myvatn. We found no observations of actual death of young.

Renesting Bengtson (1972) estimated that 31% of 45 females examined in Iceland renested.

Maximum Natural Longevity An adult banded in the Old World was recovered 15 years, 11 months, and 9 days after it was banded (Rydzewski 1978).

Weight The average weight of 8 males was 2.4 lb (1,089 g); 4 females averaged 1.8 lb (816 g)(Nelson and Martin 1953).

SUSCEPTIBILITY TO OIL POLLUTION

The Black Scoter is especially vulnerable to nearshore and offshore oiling throughout its range (Greenwood 1970, Hope-Jones 1971, Table 8). As a diving duck that forms large rafts in the open ocean where it both feeds and rests, this sea-duck seems particularly vulnerable to oiling.

Black Scoters were one of the most common oil-related casualities along both the Dutch and Belgian coasts, according to several separate beached bird surveys conducted from 1948 to 1962 (Hautekiet 1955, Morzer Bruijns 1959, de Ridder 1961, Tanis and Morzer Bruijns 1962, Kuyken and Zegers 1968, all in Vermeer and Vermeer 1974). Goethe (1961 in Vermeer and Vermeer 1974) reported that Black Scoters were the species most frequently found dead as the result of oiling on German coasts from 1953 to 1961.

Tanis and Morzer Bruijns (1968) considered the Black Scoter the species most affected by oil in the eastern North Sea, and Bourne and Devlin (1969) regarded it as the waterfowl species most vulnerable to oil in areas offshore Britain. Perry et al. (1979) estimated that 335 Black Scoters died following two spills in the Chesapeake Bay.

We have little knowledge of the size of Black Scoter populations wintering in the southeastern United States. Some evidence suggests that substantial numbers may occur in waters off South Carolina and Georgia. Fair numbers winter in North Carolina, but few are found off Florida or in the Gulf of Mexico. We also know that this is a species subject to considerable damage from oiling and one whose populations elsewhere have been affected by oil pollution. We do not have an adequate idea of the world population or of that nesting in North America. Neither do we know much of migratory pathways used by the species. Consequently, we cannot be certain of the effect of oil pollution along the Atlantic coast. If large numbers (i.e., tens of thousands) winter there regularly, oil pollution potentially could severely reduce North American populations. If few winter there, the effect of development of petroleum resources would probably be slight.

Table 8. Number of dead birds and number and percentage of dead Black Scoters found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Black Scoters	Percentage of Black Scoters	Source
North Sea coast, Denmark	1957-1958	92 (a)	52	56.52	Joensen 1972a
Poole Harbour, Dorset, England	Jan. 1961	433 (a,b)	4	0.09	Bourne 1968a
North-central Kattegat, Denmark	Jan.-Feb. 1962	1,723 (a,c)	390	22.63	Joensen 1972a
Southeast Kent, England	winters of 1963-64 to 1965-66	509 (a)	29	5.70	Gibson 1966
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	981	41.92	Joensen 1972a
North Sea coast, Denmark	1965-1966	803 (a)	87	10.83	Joensen 1972a
Northeast England	Jan. 1966	805	1	0.12	Parrack 1967
Pagham Harbour area, West Sussex, England	Jan.-Feb. 1967	91 (a,b)	4	4.39	Phillips 1967
Bornholm, Denmark	Jan.-Feb. 1968	466 (a)	82	17.60	Joensen 1972a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (b)	167	14.30	Greenwood and Keddie 1968
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	387	16.29	Joensen 1972b
Laeso-Vendsyssel, Denmark	Dec. 1969	1,362	241	17.69	Joensen 1972b

Table 8. (Continued.)

Area	Dates	Number of oiled dead birds	Number of dead Black Scoters	Percentage of Black Scoters	Source
Northeast Britain	Jan.-Feb. 1970	10,992 (a,c)	287	2.61	Greenwood et al. 1971
E. coast Jutland, Denmark	Feb.-Mar. 1970	1,974 (a)	521	26.39	Joensen 1972b
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	262	11.34	Joensen 1972b
San Francisco Bay, California	Jan. 1971	3,221 (a,d,e)	10	0.31	Smail et al. 1972
Djursland-Anholt, Denmark	Mar. 1971	239	77	32.22	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	2,663	55.96	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	4,500	49.17	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,c)	604	15.62	Gorski et al. 1976
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,c)	69	10.57	Gorski et al. 1977
Chesapeake Bay, Virginia	Feb. 1976	30,000 (f)	65	0.22	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (f)	270	0.27	Perry et al. 1979

(a) Total includes only those birds identified to species.
(b) Total includes both live and dead oiled birds.
(c) Total includes some birds that were not oiled.
(d) This figure represents birds brought to cleaning/receiving stations.
(e) Listed only as Common Scoter.
(f) Figure is an estimate based on counts of dead birds.

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SURF SCOTER

(Melanitta perspicillata)

[DA: Brilleand, DU: Gebrilde Zee-eend, FI: Pilkkaniska, FR: Macreuse a lunettes, GE: Brillenente, IT: Anitra del becco largo, NW: Brille-and, PO: Uhla amerykanska, RU: (Spotty-nosed Scoter), SP: Negron careto, SW: Vitnackad svarta]

GENERAL DISTRIBUTION

North America The Surf Scoter breeds from the Bristol Bay and Kotzebue Sound region of western Alaska east to the area of the Mackenzie Delta and Anderson River in northwestern Canada, south to northern British Columbia, Great Bear and Great Slave lakes, and Lake Athabasca; it is also found in James Bay and in the interior of Quebec and Labrador (AOU 1957, Palmer 1976b).

Surf Scoters winter primarily along the Pacific and Atlantic coasts of North America. They occur on the Pacific coast from the Aleutian chain south to the Gulf of California, and on the Atlantic coast from the Bay of Fundy south to Florida (AOU 1957, Johnsgard 1978). These scoters also occur regularly on the Great Lakes and sporadically inland throughout the western and central United States. Small numbers also winter along at least the northern half of the Gulf of Mexico. Surf Scoters are casual in Bermuda (AOU 1957) and Hawaii (Palmer 1976b).

World Distribution Surf Scoters breed and winter almost exclusively in North America. They are casual winter visitors in Europe, where most records are from Britain and Ireland. These scoters have also been reported from Iceland, Norway, Sweden, Denmark, Finland, the Faeroe Islands, the Netherlands, Belgium, France, and Czechoslovakia (Cramp et al. 1977). Surf Scoters have also occurred in the Komandorskiye Islands, on Bering Island, and on the Chukot Peninsula (Dement'ev and Gladkov 1952).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina Surf Scoters are common winter visitors to coastal North Carolina and occasionally occur there in large numbers. An estimated 18,000 were seen near Cape Hatteras, 10 January 1938 (Pearson et al. 1942), and as many as 10,000 were off Pea Island, 30 October 1971 (Teulings 1972a). These ducks are usually seen in smaller groups, however (Wray and Davis 1959). Potter et al. (1980) stated that the Surf Scoter is locally abundant off the Carolinas in October but is usually common to uncommon. The number present varies from winter to winter and from place to place. The usual period of occurrence along the coasts of the Carolinas is from October to May (Potter et al. 1980). A few birds may remain along the coast into June (Teulings 1978) and one or two are occasionally seen inland (Zapf 1945; Teulings 1971a, 1973a, 1977a).

South Carolina Sprunt and Chamberlain (1949) regarded Surf Scoters as fairly common winter residents that were more abundant in the past. Burton

(1970) regarded this species as the least common of the three species of scoter wintering in South Carolina. Recent Christmas Bird Counts (Map 26) indicate that Surf Scoters may be at least locally common along the coast of South Carolina. A few have been recorded from inland (e.g., on Lake Hartwell near Clemson [Teulings 1977a]), but the great majority are found off the coast.

Georgia Surf Scoters are uncommon winter residents on the Georgia coast, most numerous offshore. They may be expected between October and May (Denton et al. 1977).

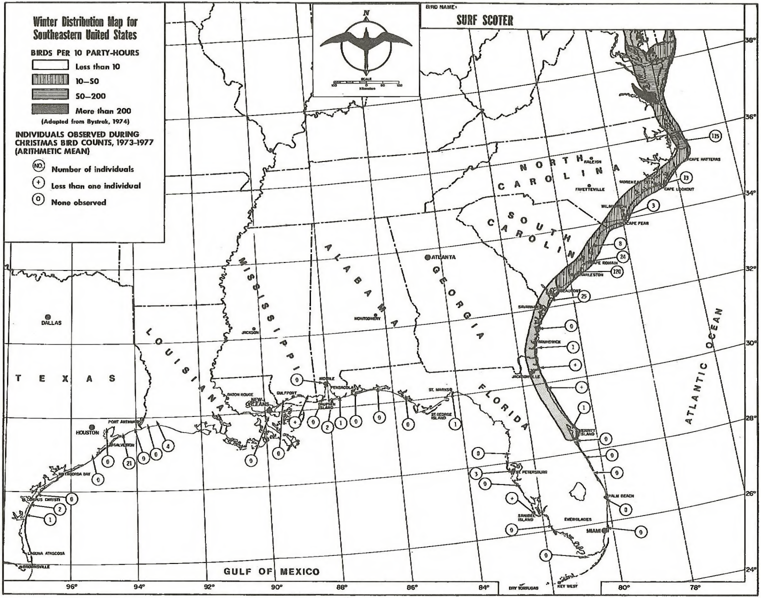
Florida The Surf Scoter is rare to uncommon in Florida and apparently always has been. Howell (1932) listed only eight records for the state between 1888 and 1932 (at Lake Worth, Punta Rosa, Saint Augustine, Talbot Island, Ponce Park, Daytona Beach, Mosquito Lagoon, and the St. Lucie River). Sprunt (1954) indicated that this species is usually present in Florida from late October to late May, but listed two exceptionally late occurrences: 25 June 1949 (Merritt Island) and 4 June 1952 (St. Marks). A few birds remain into the summer (Ogden 1971, Edscorn 1977).

Surf Scoters are presently regarded as rare to uncommon on both coasts of Florida, but are much less frequent along the southern portions. They occur almost regularly on the Atlantic coast as far south as Cape Canaveral and are uncommon but regular in the northern Gulf (Kale 1979 ms a, 1979 ms b). Seasonal reports in American Birds usually list no more than a dozen birds but in some years the number present is much greater. Some 800 Surf Scoters were seen off northwest Florida during the winter of 1978-79 (Stevenson 1979).

Alabama Imhof (1976b) considered Surf Scoters uncommon but regular winter visitors in Mississippi Sound and nearby waters. He believed that Surf Scoters are the most common scoter in Alabama. There are less than a half dozen inland records; no more than two have been seen at once. More are seen along the coast; maximum numbers recorded have been 22 birds seen at Fort Morgan, 23 January 1971, and 50-75 seen near Coffee Island on an unknown date (Imhof 1976b). The Surf Scoter has been recorded in Alabama between 6 November (Purrington 1978) and 20 April (Imhof 1976b).

Mississippi Neither Burleigh (1944) nor Gandy and Turcotte (1970) mentioned the occurrence of the Surf Scoter in Mississippi. This scoter is apparently uncommon, judging from scattered records listed in American Birds and in the Mississippi Kite, a periodical devoted to local ornithology. For the period from July 1976 through November 1978, Surf Scoters were reported in Mississippi from as early as 24 November 1977 (inland at Noxubee NWR) to as late as 15 May 1977 (Horn Island). The two largest concentrations reported during this period were up to 40 birds seen 11-17 February 1978 at East Ship Island and 80 seen 28 February 1978 at Horn Island (Weber and Jackson 1977, 1978; Jackson and Cooley 1978a).

Louisiana Lowery (1974) indicated that Surf Scoters had been recorded 19 times in Lousiana through 1973; these records total 72 birds. Through the period covering the spring of 1979, at least seven more records appeared in American Birds; these involved at least 86 individuals. More than half of the records for the Surf Scoter, the second most abundant scoter in Louisiana, are


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
☐ Less than 10
▥ 10—50
▤ 50—200
■ More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
(NO.) Number of individuals
(+) Less than one individual
(0) None observed
N
SCALE
Kilometers
BIRD NAME:
SURF SCOTER
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
CAPE HATTERAS
MOREHEAD
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
MERRITT ISLAND
PALM BEACH
MIAMI
EVERGLADES
KEY WEST
DRY TORTUGAS
SANIBEL ISLAND
ST. PETERSBURG
ST. GEORGE ISLAND
ST. MARKS
ATLANTA
MONTGOMERY
JACKSON
MOBILE
PENSACOLA
DAUPHIN ISLAND
GULFPORT
NEW ORLEANS
BATON ROUGE
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
115
13
3
8
24
120
25
0
1
+
+
1
0
0
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32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 26

from Cameron Parish. Extreme dates of occurrence are 8 November and 13 May (Lowery 1974). Surf Scoters may occur in greater abundance in the Gulf off Louisiana than the present record suggests. The largest concentrations seen include 17 birds west of Holly Beach, 24 April 1971 (Imhof 1971); 20 seen on the Sabine NWR Christmas Count in the winter of 1976-77; and 34 near Holly Beach, 21 February 1977 (Hamilton 1977).

Texas Oberholser (1974) listed this species as a rare and irregular winter visitor to Texas. He reported that Surf Scoters had occurred at least 30 times in Texas and we know of about seven more recent records. Records are chiefly from coastal areas but a few have also been reported inland. Surf Scoters usually occur in Texas between mid-October and mid-May (Oberholser 1974). Maximum numbers reported along the Texas coast during the period 1970-1978 in American Birds were an estimated 24 seen off the Bolivar Peninsula, 22-23 April 1975 (Webster 1975b); 6 at a pond in Austin, 10 December 1974 (Webster 1975a); and 5 at Texas City Dike, 7 November 1973 (Webster 1974).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Surf Scoter breeds only in North America from western Alaska east through the Yukon and Northwest Territories, south to James Bay, and in the interior of Quebec and Labrador. Bellrose (1976) estimated a breeding population of 257,000 Surf Scoters, but he gave reasons why he believed that this estimate was too low.

Winter Most wintering Surf Scoters are found along the Pacific coast from the eastern Aleutians to Baja California, and in the Atlantic from the Bay of Fundy to South Carolina (Bellrose 1976, Map 26). In the Atlantic, these scoters winter most abundantly between Barnegat Bay, New Jersey, and Norfolk, Virginia (Bellrose 1976). Surf Scoters are much less common off the Atlantic coast south of South Carolina and off the Gulf coast (Map 26). A few regularly winter on the Great Lakes. Bellrose (1976) estimated a winter population of about 765,000 birds in Alaska. However, Johnsgard (1978) warned that these estimates are highly uncertain, in that observers made little effort to distinguish scoters to species during winter surveys.

Migration Migratory pathways used by the Surf Scoter are too poorly known to warrant much speculation about them. Bellrose (1976) suggested that Surf Scoters wintering in the Pacific fly overland to the coast and that those wintering in the Atlantic move east-southeast to James Bay and then to the northeastern Atlantic coast.

HABITAT

Nesting The breeding habits of the Surf Scoter are not well known; according to Bellrose (1976), this scoter is the least studied duck in North America. Breeding habits probably resemble those of other scoters. Palmer (1976b) examined the sketchy data available and concluded that these scoters nested in brushy or forested habitats some distance from "quiet and slow-moving waters of the forest zone and semibarrens". He also stated that Surf Scoters nesting in the lake-plateau region of interior Ungava preferred to nest by bog ponds and other waters in open lichen-spruce woodland.

Feeding Johnsgard (1975) noted that foraging Surf Scoters fed in shallower waters than did White-winged Scoters and indicated that Surf Scoters forage closer to coasts than do either of the other two scoters.

Winter and Offshore Most of the wintering population is exclusively marine but small numbers also winter on the Great Lakes (Palmer 1976b). Palmer (1976b) indicated that non-breeding Surf Scoters are found more typically in the littoral zone of the ocean than are the other two scoter species. Others are found on adjoining coastal estuaries and bays. In the northeast, sandy substrates that harbor molluscs important in the diet are favored. All three species of scoters tend to congregate at the mouths of estuaries where food is more plentiful (Stott and Olson 1974 in Bellrose 1976).

FOOD AND FEEDING BEHAVIOR

Surf Scoters dive for their food. They dive either with wings closed or with half-spread wings, and they may or may not use their wings for propulsion underwater. Diving birds may clear the surface before a dive and may dive either straight down or at an angle (Palmer 1976b).

Diving periods off the shores of the North Pacific ranged from 19 to 45 sec, with the lowest mean (20 sec, n = 9) recorded in the shallowest water and the greatest mean (43.25 sec, n = 4) recorded in the deepest (Alford 1920). Surf Scoters wintering near Vancouver, British Columbia, dove for 32.7 to 65.3 sec (mean = 51.9 ± 2.29) in about 3.1 to 9.2 m (10.2 to 30.1 ft) of water (Dow 1964).

The sequence of dives made by a Horned Grebe and a Surf Scoter near Comax, Vancouver Island, British Columbia, and the behavior of the grebe suggested that these two species were feeding commensally (Pearse 1950). The grebe dove shortly after the scoter did and apparently obtained food dislodged by the feeding scoter. Paulson (1969) later reported similar observations of two Horned Grebes and a Surf Scoter at Deception Pass, Whidbey Island, Washington.

We know of no detailed information on the food habits of the Surf Scoter in the southeastern United States nor have its food habits been studied well elsewhere. Cottam (1939 in Palmer 1976b, Bellrose 1976) indicated that 88% of the diet was composed of animals, chiefly molluscs (60.8%), crustaceans (10.3%), and insects (9.6%). Studies on the wintering grounds have revealed that animal foods comprise from 96% (Maine to Long Island) to 100% (New Hampshire and Massachusetts)(authors cited in Bellrose 1976) of the food items.

Aside from molluscs (e.g., mussels, clams, olive shells), crustaceans (e.g., barnacles, clams), and various insects (mostly aquatic forms), Surf Scoters eat echinoderms (particulary *Strongylocentrotus*), marine worms, clamworms, sea anenomes, hydroids, and fish (*Ammodytes*, *Fundulus*) and their eggs (*Clupea*)(Palmer 1976b). Judging from the few studies available, blue mussels (*Mytilus edulis*), Arctic wedge clams (*Mesoderma arctatum*), Atlantic razor clams

(*Ensis* or *Siliqua costata*), and various yoldias (*Yoldia* spp.) are particularly important foods (authors cited *in* Bellrose 1976).

Plant foods eaten include pondweeds (e.g., *Potamogeton*, *Ruppia*, *Zostera*, *Zannichellia*) and representatives of a variety of other genera that are listed by Palmer (1976b).

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Almost nothing is known. Bent (1925) listed egg dates from 19 June to 8 July, basing this on twelve records.

Mean Clutch Size Unknown. Normal clutches are thought to contain 5-9 eggs (Palmer 1976b).

Incubation Period Unknown (Johnsgard 1975, Palmer 1976b).

Hatching Success Unknown (Johnsgard 1975, Palmer 1976b).

Age at Fledging Unknown (Johnsgard 1975, Palmer 1976b).

Fledging Success Unknown. Murdy (1964 *in* Bellrose 1976) found that twelve pairings produced a total of five broods over a three-year period.

Age at First Breeding Unknown. The minimum age at first breeding is suggested by Palmer (1976b) to be "presumably two years".

Mortality of Eggs and Young We have no information, nor do we have any information on whether this species renests.

Maximum Natural Longevity Unknown.

Weight Twelve males averaged 2.2 lbs (998 g), 10 females 2.0 lbs (907 g) (Nelson and Martin 1953). Five summer males from interior Alaska weighed 2.1-2.21 lb (964-1,006 g [mean = 2.17 lb or 987 g)(Irving 1960 *in* Palmer 1976b).

SUSCEPTIBILITY TO OIL POLLUTION

The Surf Scoter is a frequent victim of oiling (Table 9) and was recently rated by King and Sanger (1979) as a species of high concern in this regard in the Pacific Northwest. Palmer (1976b) stated that floating oil is a factor in the mortality of this species along both the Atlantic and Pacific coasts of North America. Many were killed during an early oil pollution incident in San Francisco Bay (Aldrich 1938), and this was one of the four species most adversely affected by the 1971 spill in the same area (Smail et al. 1972). It is of less concern in the waters of the southeastern United States since such a relatively small proportion of the total population of the Surf Scoter winters there. We consider it likely that oil spills involving these birds would decimate local populations. Areas of maximum concern in southeastern waters would be those farthest north (i.e., the Carolinas) where significant numbers may winter.

Table 9. Number of dead birds and number and percentage of dead Surf Scoters found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Surf Scoters	Percentage of Surf Scoters	Source
San Francisco Bay area, California	Mar. 1937	397 (a)	23	5.79	Aldrich 1938
San Francisco Bay, California	Jan. 1971	3,221 (a,b)	189	5.87	Smail et al. 1972
Chesapeake Bay, Virginia	Feb. 1976	30,000 (c)	1,690	5.63	Perry et al. 1979
Northern Oregon and Washington coasts	Mar. 1976	362 (a)	1	0.28	Harrington-Tweit 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (c)	400	4.00	Perry et al. 1979

(a) Total includes only those birds identified to species.
(b) This figure represents birds brought to cleaning/receiving stations.
(c) Figures are estimates based on counts of dead birds.

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1891

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WHITE-WINGED SCOTER

(Melanitta fusca)

[DA: Flojlsand, DU: Grote Zee-eend, EN: Velvet Scoter, FI: Pilkkasiipi, FR: Macreuse brune blanches, Macreuse a ailes blanches; GE: Samtente, IC: Korpond, IT: Orco marino, JA: Birodo kinkuro, NW: Sjo-orre, PO: Uhla, RU: (Hump-nosed Scoter), SP: Anade marino de alas blancas, Negron especulado; SW: Svarta]

GENERAL DISTRIBUTION

North America The White-winged Scoter breeds from northwestern Alaska, the Yukon, and the Northwest Territories east to Hudson Bay, south through western Canada to southern Manitoba (Johnsgard 1975) and south to northern North Dakota and northeastern Washington. Most of the breeding population is found in extreme northwestern Canada and northeastern Alaska (Palmer 1976b).

White-winged Scoters winter in the Aleutians and along the southern coast of Alaska south along the Pacific coast to northern Baja California. In the western Atlantic they winter mainly from southern Newfoundland south along the coast to South Carolina (Palmer 1976b), with very small numbers found farther south and along the shores of the Gulf of Mexico.

World Distribution Other races of the White-winged Scoter breed in the northern Holarctic from Fenno-Scandia east through northern Eurasia to Kamchatka thence south to Estonia and to 53° N latitude in western Siberia and Lake Baikal (BOU 1971). Old World populations largely winter along the Atlantic, North Sea, and Baltic coasts of Europe (BOU 1971, Cramp et al. 1977), and along the coasts of eastern Asia south to Japan and China (Johnsgard 1978).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina White-Winged Scoters occur in small numbers in winter (Map 27) along the North Carolina coast (Wray and Davis 1959); Potter el al. (1980) considered them uncommon. They are found on the sounds and on the ocean offshore from the outer beaches (Pearson et al. 1942). Maximum numbers reported in the regional reports of American Birds include 35 seen off Atlantic Beach, 27 April 1974 (Teulings 1974b) and about 50 seen off Pea Island, 30 October 1971 (Teulings 1972a). Several unusual inland records are summarized by Weeks (1975) and Harrison (1975).

South Carolina White-winged Scoters are rare winter visitors on the South Carolina coast, with most records of occurrence between early November and mid-

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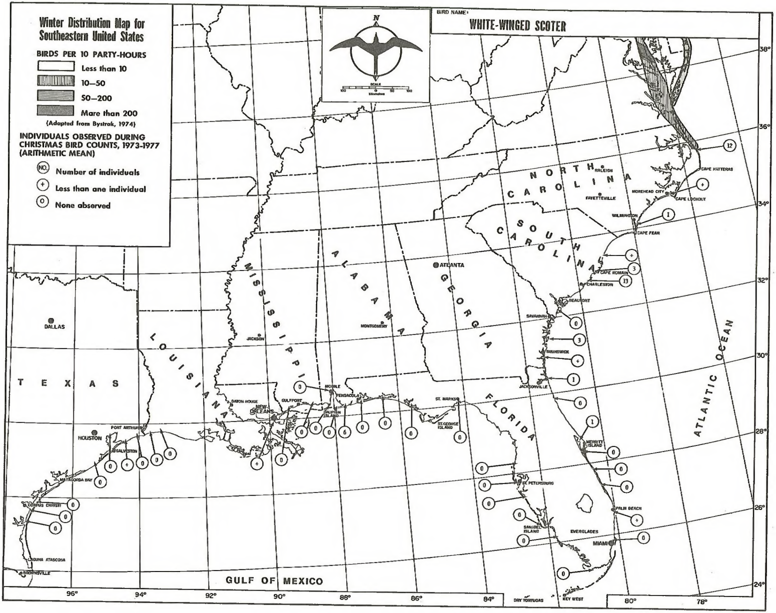
Taxonomic note: North American populations have often been considered a distinct species, M. deglandi, with two subspecies (e.g., AOU 1957). We follow most current workers in merging deglandi into fusca but have largely restricted our literature survey to references on the American population.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
(NO.) Number of individuals
(+) Less than one individual
(0) None observed
BIRD NAME:
WHITE-WINGED SCOTER
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
JACKSON
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
PALM BEACH
MERRITT ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
FAYETTEVILLE
RALEIGH
MOREHEAD CITY
CAPE LOOKOUT
CAPE HATTERAS
DRY TORTUGAS
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34°
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30°
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24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 27

May (Sprunt and Chamberlain 1949). They occur almost exclusively offshore, but Burton (1970) mentioned two inland records and Weeks (1975) reported a single female in Barnwell County, November 1967 to February 1968. Another was seen inland at Lake Greenwood, 15 January 1978 (LeGrand 1978).

Georgia Burleigh (1958) knew of only one sight record for Georgia. The first specimen for the state was taken on Tybee Island, near Savannah, 7 May 1959 by Tomkins (1959), who commented that the species may be more regular offshore than is generally realized. Observations in succeeding years sustained this suggestion and the species is now regarded as an uncommon winter resident on the coast, more abundant offshore, and rare inland (Denton et al. 1977).

Florida Sprunt (1954) listed five records of White-winged Scoter in the state. Although observations of this species, as well as of the other scoters, are more frequent now, it is still considered rare to uncommon on both coasts but regular in the upper Gulf (Kale 1979 ms a, 1979 ms b).

Alabama Imhof (1976b) regarded this scoter as a rare winter visitant to the Tennessee Valley and the Gulf coast, and rare to casual on migration elsewhere. The first specimen was a female taken inland at Wheeler NWR, Limestone County (Atkeson 1961). Most sightings are between October and April, with one each in June (Jackson and Cooley 1978b) and in August (Imhof 1976b). Along the Gulf coast, it has been reported from Gulf State Park, Gulf Shores, and Fort Morgan. The maximum number seen at one time (15) was at Fort Morgan, 29 November 1957 (Imhof 1976b).

Mississippi Gandy and Turcotte (1970) listed a single specimen of White-winged Scoter collected 6 December 1960 at Desoto Lake, Coahoma County. There are more recent records for several coastal localities (Weber and Jackson 1977, Jackson and Cooley 1978a), suggesting that the species may winter regularly in small numbers on the Gulf coast. Maximum numbers reported in recent years (12-13 birds) were seen in Mississippi Sound and off East Ship and Horn islands (Hamilton 1977, 1978; Imhof 1978).

Louisiana Lowery (1974) indicated that the status of all the scoters in Louisiana was very poorly known, largely due to a lack of adequate observations. He knew of only 27 birds reported on 21 dates from October to May, two-thirds of them from November through January. Only one of these records was made well inland.

Texas Oberholser (1974) considered this species to be rare and irregular in winter, occurring chiefly on the upper and central coasts (Chambers, Galveston, and Aransas counties). In Texas waters they prefer offshore shoals, big bays, and sounds (Oberholser 1974).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding In North America, the White-winged Scoter breeds from the upper Yukon River of Alaska and the Mackenzie River Delta south to central British Columbia, southeastern Alberta, southern Manitoba, northeastern Washington, and northern North Dakota. Old World populations breed across the northern Palearctic from Scandinavia to Kamchatka.

Using aerial and ground surveys performed by various agencies, Bellrose (1976) gave an estimate of ca. 675,000 for the North American breeding population of White-winged Scoters, but he indicated that this figure was probably too large. He also noted declines in breeding populations in some portions of the North American range; surveys of the breeding grounds in 1976 indicated declines from the 1966-75 mean for scoter species breeding in northern Alberta and the Northwest Territories (-14%), in northern Saskatchewan and northern Manitoba (-24%), and in southern Saskatchewan (-70%). Populations in southern Alberta and Manitoba increased markedly from the ten-year mean (Larned et al. 1980). Old World breeding populations are poorly known; the population breeding in the western Palearctic is apparently much smaller than that in North America and is apparently decreasing in much of its range.

Winter North American White-winged Scoters winter along the Pacific coast from the Aleutians and southern coastal Alaska to Baja California, and along the Atlantic coast from the Gulf of St. Lawrence to South Carolina. Some also winter in the Great Lakes States, and a few (Map 27) along the Gulf coast (AOU 1957, Palmer 1976b). Bellrose (1976) estimated that about 56,000 White-winged Scoters wintered along the Atlantic coast on the average during U.S. Fish and Wildlife Service inventories (1966-73). Nearly 70% of all scoters wintering along the Atlantic coast are found between Long Island Sound and the Chesapeake Bay region; areas of maximum concentration vary from species to species, however, and White-winged Scoters are most abundant from Maine to New Jersey (Bellrose 1976).

On the Pacific coast of North America the largest wintering populations of White-winged Scoters are found in the Aleutian Islands (perhaps 250,000 birds), and from southeast Alaska to California (Bellrose 1976). The 1976 winter waterfowl survey of the contiguous United States (Larned et al. 1980) listed wintering populations of 96,800 scoters in the Pacific Flyway and 59,800 in the Atlantic Flyway; another 10,500 were reported from the west coast of Mexico.

Cramp et al. (1977) considered the White-winged Scoter the least numerous sea-duck wintering in the western Palearctic and cited an estimate of perhaps 150,000-200,000 birds.

Migration Migration routes and chronology are detailed by Bellrose (1976). In general, birds migrate east or west towards the coast and then along the coastline to their wintering areas. Band recoveries suggest that the farther north and east the birds breed, the more likely they are to migrate towards the Atlantic coast, and the farther south and west they breed, the more likely that migration is to the Pacific coast (Bellrose 1976).

The northward movement of White-winged Scoters wintering along the Atlantic coast begins as early as March; migration occurs mostly in October and November (Palmer 1976b). Palmer (1976b) gave additional information on differences in migration between birds of different age and sex and remarked that data from Old World populations suggested similar patterns of movement there.

HABITAT

Nesting North American White-winged Scoters breed along inland lakes and streams, on islands and islets in inland waters, and inland in treeless or fairly open country (Palmer 1976b). Nests are commonly found near water (Palmer 1976b) but are sometimes found as much as a half-mile (a quarter kilometer) away, where they are usually situated in dense cover (authors cited in Bellrose 1976). In a recent study conducted in Saskatchewan and Alberta, Brown and Brown (1981) found that most nests were in dense cover at least 50 m (160 ft) from the nearest shoreline. Redshoot gooseberry (Ribes setosum) was the primary cover for almost all the nests found at Redberry Lake, Saskatchewan. At Jessie Lake, Alberta, gooseberry, western snowberry (Symphoricarpos occidentalis), roses (Rosa spp.), and raspberry (Rubus spp.) were all important cover plants.

Cramp et al. (1977) reported that White-winged Scoters in the Old World generally breed nearer fresh or brackish waters than does the Black Scoter. Nests are well concealed and usually within 100 m (330 ft) of water, although some may be found 2-3 km (1.2-1.9 mi) away.

Feeding Palmer (1976b) indicated that roosting and foraging birds prefer sheltered waters in shallow bays and to the lee of islands. Cramp et al. (1977) added that Velvet Scoters (= White-winged Scoters) were more likely to feed in broken water among rocks and islands than Black Scoters.

White-winged Scoters usually forage in waters less than 25 ft (7.6 m) deep but dives of as much as 60 ft (18 m) have been reported (Johnsgard 1975). Cramp et al. (1977) stated that the normal foraging depth was ca. 5 m (16 ft).

Winter and Offshore Wintering and non-breeding White-winged Scoters are usually found in brackish and marine coastal waters; in these areas, they prefer shallow water over shellfish beds that have sandy or gravelly bottoms (Palmer 1976b). Johnsgard (1975) described this habitat as the "littoral zone of the ocean, just beyond the breakers and within a mile of shore." Habitats reported for wintering birds in the Old World are similar (Cramp et al. 1977).

White-winged Scoters tend to form flocks of about 10-15 birds when large numbers are present on saltwater bays (Palmer 1976b). Cramp et al. (1977) pointed out that this species usually occurs in smaller flocks than does the Black Scoter.

FOOD AND FEEDING BEHAVIOR

White-winged Scoters feed by diving from the surface. They use their feet for propulsion and dive with partially opened wings (Palmer 1976b, Cramp et al. 1977). They make repeated short dives, with about twice as much time spent underwater as at the surface (Palmer 1976b), and they may exhibit synchronized diving (Cramp et al. 1977). In summarizing reports from various areas, Cramp et al. (1977) reported that these ducks usually submerged for 20-40 sec in southwest Finland, and they cited extremely long dives of 56 and 65 sec.

Aside from diving for food, White-winged Scoters also occasionally dabble in driftlines (Naumann 1896-1905 in Cramp et al. 1977). They feed largely by day but apparently sometimes feed at night and at dawn and dusk (Palmer 1976b).

Like the Black Scoter, White-winged Scoters feed primarily on animal life, principally molluscs and crustaceans. Cottam (1939 in Palmer 1976b) summarized food habits in North America and found that this scoter ate about 75% molluscs and about 13% crustaceans. Molluscs eaten include olive shells (*Olivella pycna*), dog whelks (*Nassarius fossatus*), blue mussels (*Mytilus edulis*), jacknife clams (*Solon solarius*), cockles (*Cardium*), snails (*Physa*), scallops, and oysters. Crustaceans eaten include crabs (e.g., *Cancer*, *Carcinus*), isopods, amphipods, shrimp, and crayfish.

White-winged Scoters also eat insects (e.g., caddisfly larvae, grasshoppers), echinoderms (sand dollars, sea-urchins, brittle stars, starfish, heart-urchin), annelids (Polychaetes), and fish and their eggs. They have also been known to eat frogs but apparently eat these, as well as fish, relatively rarely (authors cited in Bellrose 1976, Palmer 1976b, Cramp et al. 1977).

Which foods are most important in the diet varies from area to area. In different studies, blue mussels, rock clams (*Cancer irroratus*), Atlantic dog-winkle, (*Thais* or *Nucella lapillus*), Atlantic razor clams (*Ensis* or *Siliqua costata*), and Arctic wedge clams (*Mesodesma arctatum*), cockles (*Cardium edulis*) (authors cited in Bellrose 1976, Palmer 1976b), and slipper shells (*Crepidula fornicata*)(Hoff 1977) have been the principal foods eaten.

Plants eaten include pondweeds (e.g., *Zostera*, *Potamogeton*, *Ruppia*, *Vallisneria*), and sea lettuce (*Ulva*)(Palmer 1976b).

We have no quantitative information on the food habits of White-winged Scoters in southeastern waters. They presumably feed on the foods indicated above. Palmer (1976b) and Cramp et al. (1977) provided more extensive lists of foods eaten, as well as references to the primary literature dealing with the food habits of the White-winged Scoter.

SUSCEPTIBILITY TO OIL POLLUTION

White-winged Scoters appear to be highly susceptible to oil pollution. In North America, oil-related deaths of these ducks have been recorded since the 1930's. In 1937, they were among the most frequently encountered victims of an oil pollution incident in San Francisco Bay, California (Aldrich 1938, Moffitt and Orr 1938, both in Vermeer and Vermeer 1974). It was also one of the most numerous victims of an oil spill in the same area in 1971 (Smail et al. 1972, Table 10). Following the grounding of the freighter SEAGATE off the Olympic Peninsula in Washington, White-winged Scoters and Common Murres were the two species hardest hit by the subsequent oil spill (Richardson 1956, LaFave 1957, both in Vermeer and Vermeer 1974). There is also evidence of high oil-related mortality in the Old World. In a review of oil spills in Danish waters from 1953 to 1968, Joensen (1972a) listed this species as one of the most frequent victims; in the same area, most of the world's largest wintering population was lost to oil pollution in 1972 (Joensen 1972a).

Palmer (1976b) suggested that oil pollution on both coasts of North America was a greater source of mortality for the White-winged Scoter than duck hunting. King and Sanger (1979) indicated that populations of White-winged Scoters in the Pacific Northwest of the United States could be at severe risk from oil pollution. This species is evidently declining in numbers in the Old World and in some portions of its North American range. Although we have no good idea of the numbers wintering in the waters of the southeastern United States, it seems likely that the total is small compared to numbers in the more northern waters of the Atlantic and Pacific coasts. Consequently, although White-winged Scoters will probably be among the first birds lost to oil spills in the southeast, oil pollution or development of petroleum resources in this area should have little effect on the total population of this species.

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Table 10. Number of dead birds and number and percentage of dead White-winged Scoters found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead White-winged Scoters	Percentage of White-winged Scoters	Source
San Francisco Bay, area, California	Mar. 1937	397 (a)	38	9.57	Aldrich 1938
North Sea coast, Denmark	1957-1958	92 (a)	6	6.52	Joensen 1972a
North-central Kattegat, Denmark	Jan.-Feb. 1962	1,723 (a,b)	673	39.06	Joensen 1972a
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	975	41.66	Joensen 1972a
North Sea coast, Denmark	1965-1966	803 (a)	28	3.49	Joensen 1972a
Pagham Harbour area, W. Sussex, England	Jan.-Feb. 1967	91 (a,c)	1	1.10	Phillips 1967
Bornholm, Denmark	Jan.-Feb. 1968	466 (a)	36	7.73	Joensen 1972a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (c)	2	0.17	Greenwood and Keddie 1968
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	197	8.29	Joensen 1972b
Laesso-Vendsyssel, Denmark	Dec. 1969	1,362	33	2.42	Joensen 1972b
Northeast Britain	Jan.-Feb. 1970	10,992 (a,b)	58	0.53	Greenwood et al. 1971
Martha's Vineyard, MA	Feb. 1970	541 (a)	397	73.38	CSLP 1971
E. Coast Jutland, Denmark	Feb.-Mar. 1970	1,974 (a)	417	21.12	Joensen 1972b

Table 10 (Continued.)

Area	Dates	Number of oiled dead birds	Number of dead White-winged Scoters	Percentage of White-winged Scoters	Source
Off Eastern Canada	Feb.-Apr. 1970	1,276 (a,c)	2	0.16	Brown et al. 1973
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	223	9.65	Joensen 1972b
San Francisco Bay, California	Jan. 1971	3,221 (a,d)	147	4.56	Smail et al. 1972
Djursland-Anholt, Denmark	Mar. 1971	239	119	49.79	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	1,129	23.72	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	89	0.97	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,b)	292	7.55	Gorski et al. 1976
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,b)	101	15.46	Gorski et al. 1977
Chesapeake Bay, Virginia	Feb. 1976	30,000 (e)	30	0.10	Perry et al. 1979
Northern Oregon and Washington coasts	Mar. 1976	362 (a)	22	6.08	Harrington-Tweit 1979

(a) Total includes only those birds identified to species.
(b) Total includes some birds that were not oiled.
(c) Total includes both live and dead oiled birds.
(d) This figure represents birds brought to cleaning/receiving stations.
(e) Figure is an estimate based on counts of dead birds.

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COMMON GOLDENEYE

(Bucephala clangula)

[DA: Hvinand, DU: Brilduiker, EN: Goldeneye, FI: Telkka, FR: Canard garrot, GE: Schellente, IC: Hvinond, IT: Quattrocchi, JA: Hojirogamo, NW: Kvinand, PO: Gagol krzykliwy, PR: Pato dos gelos, SP: Porron osculado, SW: Knipa, US: European Goldeneye]

GENERAL DISTRIBUTION

North America North American Common Goldeneyes (B. c. americana) breed across northern North America from western and central Alaska and northern Mackenzie to northern Manitoba, northern Ontario and Quebec, central Labrador, and Newfoundland. Southern breeding limits are southern British Columbia, northwestern Montana, eastern North Dakota, northern Minnesota and Michigan, northeastern New York, northern New England, and New Brunswick (AOU 1957, Bellrose 1976). In winter, these ducks are found in open water from southeastern Alaska and northern British Columbia across the northern United States and southeastern Canada, southward to extreme northern Mexico and the Gulf coast of the United States (AOU 1957, Bellrose 1976).

World Distribution A Eurasian subspecies of the Common Goldeneye (B. c. clangula) breeds extensively across northern Europe and Asia from Norway to Kamchatka and the Komondorskiye Islands, extends southward to Germany, Switzerland, the Baltic States, central Russia, Mongolia, and Sakhalin, and occasionally nests outside this extensive range. In winter the species occurs from Britain and the southern part of the continental breeding range south to the Mediterranean nations, the Middle East, northern India, southern China, and Japan (AOU 1957, Bellrose 1976, Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina The Common Goldeneye is a regular but not abundant winter visitor in North Carolina waters. Some are found inland on fresh water, but most are in small scattered flocks in salt or brackish waters along the coast. Numbers too small to record (as other than "trace") were found in North Carolina during the 1975 winter survey (Goldsberry et al. 1980). Wintering Goldeneyes normally are seen between October and March, bur occasional migrants may be found as late as May or June (Pearson et al. 1942, Wray and Davis 1959).

South Carolina These ducks are fairly common winter residents of coastal South Carolina, generally found from November to April (Sprunt and Chamberlain 1949). The January 1975 waterfowl survey reported 100 birds (Goldsberry et al. 1980).

Georgia The Common Goldeneye is an uncommon winter resident in Georgia, occurring in suitable localities throughout the state from about November to early April (Burleigh 1958, Denton et al. 1977). None was reported on the 1975 winter waterfowl survey (Goldsberry et al. 1980).

Florida Sprunt (1954) reported that the Common Goldeneye was found in winter (November-March) throughout the state, but was never common. More recently, Kale (1979 ms a) listed the species as rare along the Atlantic coast of Florida but fairly common (though not abundant) on the Gulf coast north of St. Marks NWR (Kale 1979 ms b). On the basis of earlier waterfowl surveys, Bellrose (1976) estimated that the Florida wintering population held about 100 birds. The January 1975 winter survey reported 200 (Goldsberry et al. 1980).

Alabama Imhof (1976b) considered this species uncommon in most of interior Alabama, although it may be locally common in the Tennessee Valley and in salt water bays of the Gulf coast. The maximum mid-winter counts reported, at Dauphin Island, were between 400 and 500. Inland, as many as 200 have been seen near Decatur (Hamilton 1978). Three hundred were recorded in Alabama waters during the January 1975 waterfowl survey (Goldsberry et al. 1980).

Mississippi Burleigh (1944) reported that goldeneyes occur regularly, but in very small numbers, along the Gulf coast of Mississippi. More recent observations in the state (Jackson 1976, Jackson and Weber 1976) suggest that this pattern still holds. The largest groups of Common Goldeneyes reported were of 18 and 10 birds (Jackson and Weber 1977, Jackson and Cooley 1978a). None was reported for either Mississippi or Louisiana during the 1975 winter survey (Goldsberry et al. 1980).

Louisiana The Common Goldeneye is seen regularly in bays and lagoons along the coast, and in large lakes, but not in large numbers. In most instances, the winter visit lasts only from November to February (Lowery 1974).

Texas The Common Goldeneye occurs irregularly along the Texas coast, although it may be locally common at times (Oberholser 1974). Bellrose (1976) indicated that some 1,300 goldeneyes winter in Texas; only about 100 reach the coast. Only 30 were reported on the 1975 census (Goldsberry et al. 1980). They usually occur in Texas from mid-November to mid-May, although a few Common Goldeneyes are occasionally seen outside these periods (Oberholser 1974).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding In North America, the Common Goldeneye breeds primarily in Canada in a broad area from central Alaska, the Yukon Territory, and northwestern Mackenzie eastward across the Prairie Provinces to Hudson Bay and the Atlantic coast of Labrador and Newfoundland. The southern limits of the breeding range are in the northern tier of the United States (Bellrose 1976, Palmer 1976b). Estimates of summer populations in Canada total approximately 1,225,000 birds; Alaskan birds number about 45,000, and those in the United States south of Canada, about 10,000 (Bellrose 1976). The centers of abundance in Canada are the boreal forests. Breeding populations in Europe are large; Cramp et al. (1977) cited breeding populations of about 100,000 birds in Finland and about 240,000 in European and western Asian U.S.S.R.

Winter Winter populations of the Common Goldeneye seem small relative to breeding numbers, probably because the coastal areas favored by the species are not surveyed intensively. Half of the continental winter population is off the Pacific coast, and about a third is off the Atlantic coast. In the latter area, the main wintering ground is between Long Island Sound and North Carolina. Only about 1,500 birds normally winter south of Virginia (Bellrose 1976). The largest numbers of wintering birds on the Pacific coast of North America are found in southeastern Alaska and British Columbia (Palmer 1976b).

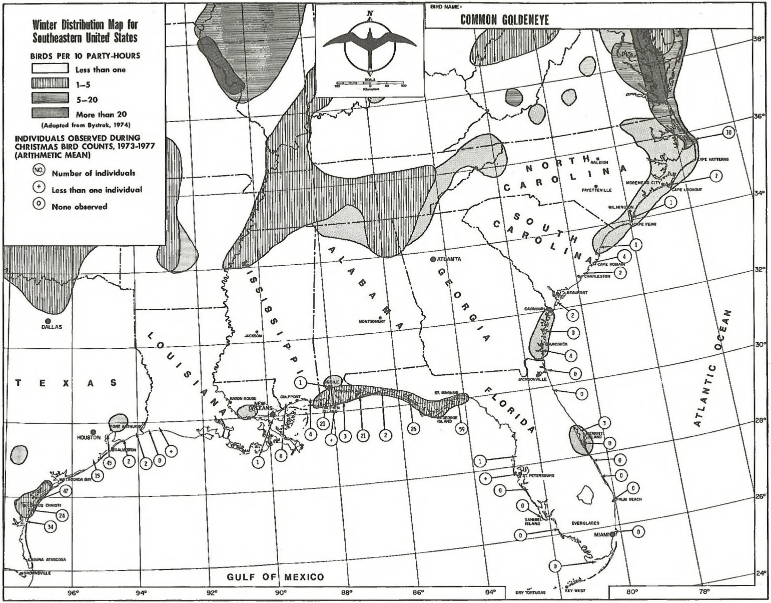
Judging from figures provided by the most recent winter survey (Goldsberry et al. 1980) and from recent Christmas count data (Map 28), the Common Goldeneye reaches its peak abundance in the southeastern United States in the northern and western Gulf of Mexico. Calculations based on the waterfowl harvest survey for the 1974-1975 hunting season (Larned et al. 1980) also support this conclusion. The estimated number of goldeneyes that were killed and retrieved in 1975 in each of the southeastern states is as follows: North Carolina - 0, South Carolina - 0, Georgia - 0, Florida - 0, Alabama - 328, Mississippi - 0, Louisiana - 2,437, and Texas - 1,202--a total of 3,639 birds. The figures for Louisiana and Texas much exceed those obtained on the winter watefowl survey for 1975 (2,437 vs. 0, and 1,202 vs. 30); the figure for Alabama is only slightly greater (328 vs. 300).

Approximately 114,000 goldeneyes were reported within the contiguous United States during the January 1975 winter waterfowl survey (Goldsberry et al. 1980). Only 630 (0.55%) of these were reported from southeastern waters. The largest wintering populations were found in Washington (20,833), Maine (12,525), Maryland (11,300), and Illinois (10,800). Bellrose (1976) indicated that about 80% of the goldeneyes wintering in Washington are Common Goldeneyes; the populations in Maine, Maryland, and Illinois are presumably almost entirely Common Goldeneyes.

Data provided by Bellrose (1976) from ground and aerial surveys for areas in North America outside the contiguous United States suggest wintering populations of at least 50,000 birds in Alaska, British Columbia, and the Aleutians; 5,500 in Newfoundland and the Maritimes; and 550 along the Mexican coasts.

Cramp et al. (1977) listed wintering populations for northern and central Europe that total about 210,000 birds, the great majority (170,000) of which are in Danish waters. Another 52,000 winter in the western U.S.S.R.

Migration The migration pattern of North American Common Goldeneyes is not well defined, partly because of the proximity of breeding and wintering areas. Many move only a short distance from breeding grounds to wintering areas but others may migrate as far as 800-1,200 mi (1,300-1,900 km)(Palmer 1976b). Apparently most birds from the interior move to the coasts in fall, dispersing to the south along the coasts rather than inland (Bellrose 1976). Spring migration begins about the end of February in the southern part of the wintering range in the conterminous United States and reaches a peak in late March and early April; fall migration begins in early October and peaks in November and December (Palmer 1976b).


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
BIRD NAME:
COMMON GOLDENEYE
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
JACKSON
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
JACKSONVILLE
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
PALM BEACH
MERRITT ISLAND
DRY TORTUGAS
KEY WEST
SAVANNAH
BRUNSWICK
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
CAPE LOOKOUT
MOREHEAD CITY
CAPE HATTERAS
RALEIGH
FAYETTEVILLE
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°
34
24
47
15
45
2
2
0
+
1
8
4
21
+
3
21
2
26
59
1
1
+
0
0
0
0
0
0
0
3
0
0
4
0
2
2
4
1
1
7
10

Map 28

HABITAT

Nesting The Common Goldeneye nests in holes, usually natural cavities in trees, primarily in boreal forests, or in man-made nest boxes. More exotic nesting sites include a ledge within a church tower (Bellrose 1976) and rabbit (Oryctolagus cuniculus) burrows (Cramp et al. 1977). Open woods near the edges of fields or marshes are preferred (Bellrose 1976). Palmer (1976b) also noted nesting in floodplain forest, and on bog ponds and small lakes in forests.

Feeding Common Goldeneyes in southwest Sweden preferred to feed on lakes that apparently lacked fish; Eriksson (1979b) believed that this choice was the result of competition between the ducks and the fish for food eaten by both. During autumn on the Swedish west coast most Goldeneyes are found on subaquatic meadows of Zostera marina, Ruppia spp., and Characeae (Pehrsson 1976). Goldeneyes take most of their food from the bottom at depths of up to 4 m (13 ft), with few probably diving deeper than 9 m (30 ft)(Olney and Mills 1963). Palmer (1976b) reported that most food is obtained in 3-12 ft (0.9-3.7 m) of water; maximum depths records for dives are about 20 ft (6 m). Goldeneyes take food from submerged surfaces or from the water, and frequently overturn and search beneath stones (Olney and Mills 1963).

Winter and Offshore Most Common Goldeneyes move to the coasts in winter and frequent the open ocean or bays there. Some are found on fresh water in the interior of the United States where large rivers and lakes remain unfrozen. Palmer (1976b) indicated that non-breeding birds of this species are typically found in shallow bays but raft at night well out from shore. Non-breeding birds are also found in estuaries (preferably brackish) and near the mouths of rivers (Palmer 1976b). Cramp et al. (1977) indicated that Common Goldeneyes are found widely on both salt and fresh water in the western Palearctic but prefer estuaries and marine bays, sheltered shallow waters along the coast, and sewage outfalls. These ducks are usually found in small flocks but may occur in aggregations of up to several hundred birds (Cramp et al. 1977).

FOOD AND FEEDING BEHAVIOR

Most Common Goldeneyes feed by day, obtaining their food by diving, apparently to the bottom, except when pursuing fish. Bellrose (1976) timed 18 dives by feeding Goldeneyes in the interior United States and found that they averaged 30 sec in duration, with a range of 11-41 sec. Eriksson (1976) found that ducklings fed by four methods: diving, surface feeding, dabbling, and pecking at emergent vegetation. Diving occurred most frequently. Synchronous diving by members of a feeding flock has been observed; in other instances, members of a flock may dive one after another in rapid succession (Geroudet 1965 in Cramp et al. 1977).

Goldeneyes feed predominantly on animal matter but may feed to a considerable extent on plants in late spring and autumn; in addition, these ducks exhibited marked local and seasonal variation in diet (Pehrsson 1976). Animal foods made up three-quarters of the diet of a sample of 395 Common Goldeneyes examined by Cottam (1939 in Bellrose 1976); crustaceans, insects, molluscs, and fish were the important groups represented. Among the plant food taken were pondweed, wild celery, and seeds of other aquatic plants. In a study of wintering birds on Chesapeake Bay, Stewart (1962) found that the diet consisted largely of crustaceans, molluscs, and small fish, with some plant material. Crustacea (particularly crabs), insect larvae, amphipods, molluscs, and small fish made up most of the diet in Britain, with plant material reported from only two of four samples and in low percentages (Olney and Mills 1963). Pehrsson (1976) found that Common Goldeneyes feed on smaller mussels (Mytilus edulis) than those eaten by other diving ducks in the same area. Thus, food habits seem to be the same on both sides of the Atlantic. A study of the food of Common Goldeneye ducklings in Sweden revealed that they fed almost entirely on aquatic insects, both adults and larvae (Eriksson 1976).

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Nesting may begin in mid-April and continue through much of May with regional and seasonal variation (Bellrose 1976), probably depending on local weather conditions. Eggs are laid every second day (Bellrose 1976). The mean date of the beginning of egg laying at one locality in southwest Sweden, 1971-1977, varied from 15 April to 9 May (Eriksson 1979c). Other studies in Europe found most eggs present from about mid-May through June (Cramp et al. 1977).

Mean Clutch Size Clutches in 75 North American nests held from 5 to 15 eggs and averaged 9.21 eggs (Bellrose 1976). In Finland, the mean size of 63 clutches was 9.3, ranging from 5 to 17 (Linkola 1962 in Cramp et al. 1977). Clutch size in Sweden varied from a mean of 8.5 to 10.2 over the period 1971-1977 (Eriksson 1979c). The range of clutch sizes recorded for this area was 3-15 for the period 1974-1977 (Eriksson 1979a), but Eriksson defined clutch size as the number of eggs in a nest in which incubation was known to have occurred. Consequently, his figures would have included nests in which more than one female laid eggs and those in which eggs were lost during egg laying. Clutches laid late in the season in southwestern Sweden were significantly smaller than those laid earlier (Eriksson 1979c).

Incubation Period Incubation takes 28-32 days, with an average of 30 days (Bellrose 1976). Cramp et al. (1977) indicated that most incubation periods are 29 to 30 days and listed extremes of 27 and 32 days.

Hatching Success An average clutch of 9.2 eggs produces an average of 6.3 ducklings but a mean of only about 4.1 survives to near-fledging age (Bellrose 1976). An average clutch of 9.3 eggs at hatching produced an average of 4.7 young reared in Finland (Linkola 1962 in Cramp et al. 1977). In Sweden, a mean of 8.9 young hatched in nests in which at least one young hatched, but an average of only 27% of the clutches hatched any eggs (Eriksson 1979c). Studies reported in Bellrose (1976), largely on North American Goldeneyes, indicate that 50-69% of the nests result in at least one duckling hatched. In a study conducted in southwestern Sweden, 1971-1977, the percentage of clutches that hatched ranged from 16 to 38% (Eriksson 1979c).

Fledging Success Bellrose (1976) reported that Common Goldeneye broods suffer unusually high losses. He noted that an average clutch of 9.2 eggs resulted in only 4.71 ducklings by the time the young were fully feathered but not yet capable of flight.

Age at Fledging Age at first flight for North American birds is 56-60 days (Bellrose 1976). Cramp et al. (1977) indicated a fledging period of 57 to 66 days, with ducklings becoming independent of their parents at about 50 days.

Age at First Breeding Bellrose (1976) suggested that most Common Goldeneyes breed for the first time in their second year, and cited a report indicating that some may not breed until their third year or later.

Mortality of Eggs and Young Nests in Minnesota were destroyed by raccoons (*Procyon lotor*), red squirrels (*Tamiasciurus hudsonicus*), and Starlings (*Sturnus vulgaris*)(Johnson 1967 *in* Bellrose 1976). Eggs were eaten by martens (*Martes martes*) and jays (*Garrulus glandarius*) in southwest Sweden (Eriksson 1979c). Dump nesting causes the desertion of some nests, as does human disturbance (Bellrose 1976). Loss of clutches in southwest Sweden, 1971-1977, was attributed to desertion (22% of nests lost) and predation (52%); the reason why other nesting attempts failed was not known. Two earlier studies conducted in Finland found desertion to be the most common cause of nest failure (Eriksson 1979c). Palmer (1976b) noted that competition for nest sites was a source of egg loss. Very little is known of the sources of mortality in young birds.

Renesting Bellrose (1976) suggested that some renesting probably occurs if nests are lost during egg-laying and remarked that probably only a small proportion of hens that lose clutches re-lay. Linkola (1962 *in* Cramp et al. 1977) indicated that this was the situation for birds nesting in Europe.

Maximum Natural Longevity A Common Goldeneye banded in North America apparently reached an age of at least 14 years and 3 months (Clapp et al. in press). Another bird banded when full grown in Europe survived for another 17 years (Rydzewski 1978).

Weight Fifty-eight males averaged 2.2 lb (998 g) and 53 females averaged 1.8 lb (816 g)(Nelson and Martin 1953).

SUSCEPTIBILITY TO OIL POLLUTION

The Common Goldeneye is frequently a victim of oiling but usually only a few individuals are involved (Table 11). King and Sanger (1979) considered this species one that could be affected by oil pollution in the Pacific Northwest but not one that would be severely at risk. Recent oil spills in Chesapeake Bay resulted in relatively large fatalities for wintering Common Goldeneyes (Table 11). Common Goldeneyes are not abundant in waters of the southeastern United States, and the birds do not gather in large rafts as do many sea ducks. In most of the southeastern states, oiling is unlikely to have a substantially detrimental effect on the overall population of the Common Goldeneye. However, these birds might suffer significant losses in the colder, more northern, waters of North Carolina, and possibly during cold winters along the northern and western Gulf, where the species may be more abundant than is usually thought.

Table 11. Number of dead birds and number and percentage of dead Common Goldeneyes found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Common Goldeneyes	Percentage of Common Goldeneyes	Source
Poole Harbor, Dorset, England	Jan. 1961	433 (a,b)	13	3.00	Bourne 1968a
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	14	0.60	Joensen 1972a
Northeast England	Jan. 1966	805	1	0.12	Parrack 1967
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	3	0.13	Joensen 1972b
Laesso-Vendsyssel, Denmark	Dec. 1969	1,362	3	0.22	Joensen 1972b
Northeast Britain	Jan.-Feb. 1970	10,992 (a,c)	5	0.05	Greenwood et al. 1971
Martha's Vineyard, MA	Feb. 1970	541 (a)	13	2.40	CSLP 1971
E. coast Jutland, Denmark	Feb.-Mar. 1970	1,974 (a)	13	0.66	Joensen 1972b
Off Eastern Canada	Feb.-Apr. 1970	1,276 (a,c)	4	0.31	Brown et al. 1973
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	9	0.39	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	21	0.44	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	16	0.17	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,b)	34	0.88	Gorski et al. 1976
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,b)	5	0.77	Gorski et al. 1977

Table 11 (Continued.)

Area	Dates	Number of oiled dead birds	Number of dead Common Golden-eyes	Percent-age of Common Golden-eyes	Source
Chesapeake Bay, Virginia	Feb. 1976	30,000 (a,c)	330	1.10	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (a,c)	1,650	16.50	Perry et al. 1979
Firth of Forth, southern Scotland	Feb. 1978	680 (a)	18	2.65	Campbell et al. 1978

(a) Total includes only those birds identified to species.
(b) Total includes some birds that were not oiled.
(c) This figure is an estimate based on counts of dead birds.

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BUFFLEHEAD

(Bucephala albeola)

[DA: Amerikansk Hvinand, DU: Buffelkopeend, EN: Buffel-headed Duck, FI: Pikkutelkka, FR: Garrot albeole, GE: Buffelkopfente, IC: Hjalmond, IT: Quattrocchi americano, JA: Hime hijiro, PO: Gagol malutki, RU: (Small Goldeneye), SP: Porron albeola, Pato cabeza clara; SW: Buffelhuvud]

GENERAL DISTRIBUTION

North America Buffleheads breed from central Alaska, the Yukon Territory, and British Columbia eastward through the forested portions of Canada to Ontario, and perhaps to the Ungava Peninsula. The main range extends south into the United States only in Montana, Idaho, and North Dakota, but there are isolated breeding populations in the mountains of several western states (Erskine 1972), as well as a recent breeding record from central Idaho (Lannoy and Sakaguchi 1979). There are old records from beyond the primary present range (AOU 1957, Palmer 1976b).

In winter, Buffleheads are found from the Aleutian Islands south along the Pacific coast to northern Mexico, along the Atlantic coast from Newfoundland, Nova Scotia, and New Brunswick to the northern portions of Florida, and along the Gulf coast to Tamaulipas, Mexico (AOU 1957, Palmer 1976b). Buffleheads also winter in the interior of North America on open water from the Great Lakes southwest to the central interior highlands of Mexico (Palmer 1976b).

World Distribution The Bufflehead is a Nearctic species, and records outside of North America represent stagglers. The most common extralimital records come from the Komandorskiye Islands and the Kamchatka Peninsula in the western U.S.S.R. during fall and winter. Individuals have also been reported as far south in the Pacific as the Kuril Islands, Japan, and Hawaii (Palmer 1976b). To the southeast, Buffleheads have straggled to Bermuda, Puerto Rico, Cuba, and Jamaica (Palmer 1976b), and to the northeast and east have wandered to Greenland, Britain, Czechoslovakia (Palmer 1976b), and Iceland (Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina Buffleheads are winter residents in North Carolina, where they are usually found in small groups on lakes or other open water (Pearson et al. 1942). They are present from November through April or May and are more common along the coast than inland (Potter et al. 1980). Bellrose (1976) reported that about 7,100 Buffleheads were seen in North Carolina on winter waterfowl surveys (1955-1974), making this state the most important wintering ground along the southeastern Atlantic coast. The 1975 winter waterfowl survey reported 3,000 Buffleheads (Goldsberry et al. 1980); about 3,800 were believed to have been killed there during the preceding hunting season (Larned et al. 1980). Large congregations are occasionally recorded. Pearson et al. (1942) noted the presence of 2,500 on Pea Island during the winter of 1940-41.

South Carolina Buffleheads are fairly common winter residents in South Carolina, generally arriving in early November and sometimes lingering until late April. They prefer salt water and are most numerous along the coast on marshes, bays, tidal rivers, and the Inland Waterway; they occasionally occur inland on freshwater ponds and rice fields (Sprunt and Chamberlain 1949). January waterfowl surveys typically found 350 Buffleheads in South Carolina (Bellrose 1976); 300 were found there during the January 1975 survey (Goldsberry et al. 1980). Winter populations are doubtless larger than this, however, since an estimate based on data provided by Larned et al. (1980) suggests that about 850 were killed there during the 1975 hunting season. In addition, four recent Christmas Counts (that covered only a portion of the coast) averaged a total of slightly over 350 birds (Map 29).

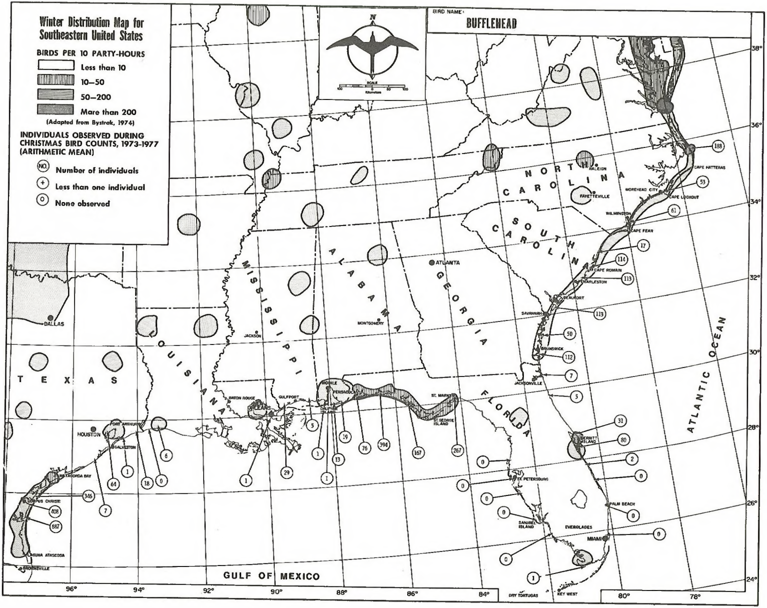
Georgia Burleigh (1958) regarded the Bufflehead as an uncommon transient and winter resident throughout the state. Denton et al. (1977) assigned it the same status, and gave dates of occurrence from early November to late April. Bellrose (1976) reported that some 35 were seen there on January waterfowl surveys; 200 were reported on the January 1975 survey (Goldsberry et al. 1980).

Florida This species occurs in Florida as an uncommon winter visitor, chiefly on the northern Gulf coast. Howell (1932) gave only two records from the Atlantic coast. Sprunt (1954) reported that Buffleheads occur sparingly in the central portions of the state south to Lake Okeechobee, their normal southern limit in the state. At present the Bufflehead is uncommon on the Atlantic coast, with small concentrations at Merritt Island NWR (Kale 1979 ms a, Map 29). It is generally uncommon on the Gulf coast, although more numerous in the upper Gulf (Kale 1979 ms b, Map 29). Bellrose reported that about 950 were seen on winter surveys; 1,000 were reported there on the January 1975 survey (Goldsberry et al. 1980). Recent Audubon Christmas Bird Counts averaged slightly over 1,000 Buffleheads (Map 29).

Alabama Buffleheads are winter residents in Alabama. They are found both inland and on the outermost bays of the Gulf coast and are equally abundant on fresh and salt water. These ducks have been reported from early November to late April along the coast; the maximum concentration reported there was 215 birds observed at Bon Secour Bay on 8 February 1957 (Imhof 1976b). Bellrose (1976) gave no figures for populations wintering in Alabama; the 1975 winter waterfowl survey found 500 birds (Goldsberry et al. 1980)

Mississippi Burleigh (1944) reported that the Bufflehead winters in extremely small numbers on the Gulf coast. More recent observations indicate that the species occurs in winter in small numbers throughout the state from early November to late March (Jackson and Weber 1976, Jackson and Cooley 1978a). The largest concentration reported was 120 birds at Horn Island on 16 January 1978 (Jackson and Cooley 1978a). None were reported during the 1975 waterfowl survey (Goldsberry et al. 1980), but slightly over 800 were believed to have been shot and retrieved by hunters during the preceding hunting season (Larned et al. 1980).

Louisiana The Bufflehead is usually in Louisiana from November to March,


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than 10
10–50
50–200
More than 200
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
NO. Number of individuals
+ Less than one individual
0 None observed
BIRD NAME:
BUFFLEHEAD
N
SCALE
Kilometers
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
MOREHEAD CITY
CAPE HATTERAS
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
PENSACOLA
DAUPHIN ISLAND
ST. MARKS
ST. GEORGE ISLAND
MERRITT ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
PALM BEACH
MIAMI
DRY TORTUGAS
KEY WEST
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
188
53
61
17
114
113
113
50
112
7
5
31
80
2
0
0
0
0
0
0
0
1
267
167
394
76
19
13
1
1
5
29
1
6
0
18
1
64
7
346
408
687
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
76°

Map 29

with extreme dates of occurrence from mid-October to late April. These ducks occur throughout the state but are most frequent in the deepest lakes and bays (Lowery 1974). As in Mississippi, none were reported during the 1975 winter waterfowl census (Goldsberry et al. 1980), but slightly more than 800 were shot by hunters the preceding hunting season (Larned et al. 1980).

Texas The Bufflehead occurs in Texas from early November to late April as a winter resident. Oberholser (1974) considered the species locally common to scarce in the western half of the state and uncommon to rare in the eastern half. Bellrose (1976) reported that the average seen on winter surveys was 4,300 Buffleheads. These ducks may now be more common along the Texas coast than this information suggests. Blacklock (1978 ms) considered the species common in winter, with peak densities present from December to February. Goldsberry et al. (1980) reported 7,730 Buffleheads during the 1975 winter survey of Texas; this was more than twice that reported for all of the other southeastern states. In addition, average Christmas Bird Counts for recent years were larger along the southern Texas coast than anywhere else in the southeast (Map 29).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Bufflehead breeds solely in North America. It breeds from central Alaska east through the Yukon Territory and northern Mackenzie District, across British Columbia, Alberta, Saskatchewan, and Manitoba, to Ontario, and probably into Quebec. It breeds south only as far as northern Idaho and northwestern Montana (AOU 1957, Erskine 1972, Palmer 1976b). Isolated breeding populations occur in central Oregon, northeastern California, northwestern Wyoming, and northern and eastern Idaho (AOU 1957, Palmer 1976b, Lannoy and Sakaguchi 1979).

Erskine (1972) suggested a range of between one-quarter and three-quarters of a million birds in the spring population of Buffleheads in North America. Bellrose (1976) analyzed additional breeding ground surveys and indicated that the spring pre-breeding population was about 745,000 birds; Erskine's earlier analysis of the same kind of data had resulted in an estimate of 500,000. A majority of the population (423,000 birds) is found in the closed boreal forest and extensive parklands of the Canadian Prairie Provinces but the greatest densities (10 per sq mi) are found in the Cariboo District of British Columbia (Bellrose 1976). A survey of part of the breeding grounds in 1976 (Larned et al. 1980) revealed a population of about 896,000 birds. Nearly half (45.1%) of these were in northern Alberta, northeastern British Columbia, and the Northwest Territories. Substantial numbers were also found in northern Saskatchewan, northern Manitoba, and the Saskatchewan River Delta (30.3%), and in Alaska (13.1%).

Winter Buffleheads winter along the Pacific coast from the Aleutians to Sinaloa on the central Mexican coast, and along the Atlantic coast from Nova Scotia and New Brunswick south (Map 29) to northern Florida and the Gulf coast as far as Tamaulipas (AOU 1957); they are also found in larger inland lakes (Bellrose 1976). In 1966-69, winter surveys by the U.S. Fish and Wildlife Service found 90,000 Buffleheads (Johnsgard 1975). Bellrose (1976) indicated that nearly 13,000 more winter on Alaskan refuges and that Audubon Christmas Bird

Counts reported about 150 wintering in Nova Scotia, New Brunswick, and Quebec. About 53.4% of the 90,000 Buffleheads reported by Johnsgard (1975) winter in the Atlantic Flyway with another 35.6% in the Pacific Flyway, 6.2% in the Mississippi Flyway, and about 4.6% in the Central Flyway. The proportions for the Pacific and Central flyways include counts for the west coast of Mexico and for the interior and east coast of Mexico, respectively.

About 90,850 Buffleheads were found on the 1975 winter waterfowl survey, 5,990 of which were in Mexico (Goldsberry et al. 1980). The proportions found in the Pacific (29.9%) and Atlantic (52.1%) flyways were similar to those reported by Johnsgard (1975), but the proportion in the Central Flyway (15.7%) was considerably larger, principally because of the large number reported from Texas. The Mississippi Flyway held the remaining 2.3%. Proportions found in each flyway during the 1976 survey (Larned et al. 1980) were roughly similar, but the proportion in the Central Flyway (8.9%) was, as in the preceding year, greater than in the Mississippi Flyway (4.6%), suggesting that there may have been a change in the winter distribution of the Bufflehead in the southeast.

In 1975 the southeastern United States harbored 12,820 (ca. 14.1%) of the total found on the winter survey; about 60% of the Buffleheads in the southeast were found in Texas, which held the fifth largest wintering population. The largest wintering populations were found in Maryland (14,300), Washington (13,686), New Jersey (12,260) and California (7,877). Figures provided earlier by Bellrose (1976) suggested that roughly 19% of the population wintering in the contiguous United States and Mexico was found in the southeastern United States. The largest numbers of wintering birds were found in Washington (ca. 15,000), New Jersey (9,900), Maryland (8,800), North Carolina (7,100) and Texas (4,300).

Migration During fall migration most Buffleheads migrate from their breeding grounds in northwestern North America either southwest to the Pacific coast or southeast to the north Atlantic coast (Bellrose 1976). Erskine (1972) pointed out that the migratory pathways divide in Alberta. From a triangular area about 150 mi (241 km) across at its base near 54° N latitude, Buffleheads may follow a variety of routes; this area is the source of most birds migrating south. Almost all Buffleheads to the west of this area migrate southwest and most of those to the east move southeast.

Considerably less is known about routes employed by migrating Buffleheads during the spring because relatively few birds are banded during the winter and only a few are shot (illegally) during the spring. The routes taken may well be very similar to those employed in fall (Erskine 1972).

Erskine (1972) provided the most information on Bufflehead migration and his work has been ably summarized by Palmer (1976b) and Bellrose (1976). By February, wintering Buffleheads may be moving north along the Atlantic coast to the areas from which they will migrate overland to the breeding grounds. Most will have left the Gulf and southeastern Atlantic coasts by March. During fall migration the major movement by migrating Buffleheads apparently occurs in late October and early November with most of these ducks reaching their wintering grounds during December (Palmer 1976b). Bellrose (1976), Palmer (1976b), and especially Erskine (1972) should be consulted for further details on migration in areas other than the southeast.

HABITAT

Nesting The Bufflehead is one of the few hole-nesting ducks and is consequently associated with forests in its breeding distribution. These ducks nest primarily in mixed coniferous-deciduous woodlands north and west of the Great Plains (Palmer 1976b). Palmer (1976b) indicated that Buffleheads typically nest in or by small, shallow, fresh or slightly alkaline bodies of water that have little emergent vegetation around their margins. Erskine (1972) characterized lakes used for breeding as moderately to highly eutrophic, and indicated that Buffleheads avoid both shallow, weedy sloughs and large, deep, gravel-shored lakes.

Nest density is closely related to the presence of deciduous trees containing Common Flicker (Colaptes auratus) holes, especially aspen. Flicker holes are preferred, but holes excavated by Pileated Woodpeckers (Dryocopus pileatus) are also used. Burned areas and parkland groves of aspens which support large numbers of nesting Flickers also support large numbers of Buffleheads. Few nest far from water or in dense forest (Palmer 1976b).

Most of 205 nests found in breeding areas from Alaska to California and Saskatchewan were found in in Quaking Aspen (Populus tremuloides - 52.2%) and Douglas Fir (Pseudotsuga menziesii - 21.5%)(Erskine 1972).

Feeding Buffleheads prefer to feed in shallow water, with most feeding done at depths of about 6-10 ft (1.8-3.0 m)(Erskine 1972).

Winter and Offshore Buffleheads seek out sheltered portions of the marine habitat for winter, avoiding the more exposed coasts. They particularly favor shallow waters over mud flats that are exposed at low tide. Habitats utilized range from secluded coves, river mouths, and shoals along flat Gulf shores to the icy edges of rocky coasts (Erskine 1972). Wintering Buffleheads may occur quite far from shore and may winter on sheltered salt water, slightly brackish water, and on inland fresh water just south of the areas in which most such waters freeze (Palmer 1976b).

FOOD AND FEEDING BEHAVIOR

Buffleheads feed predominantly by diving, using the feet for propulsion (Erskine 1972). They have also been seen wading in shallow water seizing food with their heads submerged beneath the water and also seizing food at the surface (King 1976). In another instance, a flock was seen up-ending on the Indian River at Cape Canaveral (King 1976). Buffleheads may dive for food individually but when in flocks often exhibit synchronized diving. Most dives take 15-25 sec in water 6-10 ft (1.8-3.0 m) deep; dives may average as little as 10 sec in shallower water.

Palmer (1976b) summarized Erskine's (1972) fine synthesis of the feeding habits of the Bufflehead by stating that "The Bufflehead feeds primarily on small animals: aquatic insects, shrimps, snails, etc. (total 70%-90%), to a much lesser extent on seeds and other portions of aquatic plants." The primary foods taken on fresh water in spring and summer are insects; in autumn, insects, gastropods, and plants; and in winter, molluscs, the latter mostly snails. Birds on salt water from fall through spring feed chiefly on crustaceans and molluscs and to a limited extent on insects (Palmer 1976b). Erskine (1972) summarized the food habits of Buffleheads by stating that in all seasons they feed primarily on arthropods and only secondarily on molluscs; they feed chiefly on insects while on fresh water and on crustaceans on salt water. The most important food in marine situations are decapods, including both shrimp and crabs; isopods are also frequently eaten. Minor items of diet include marine worms, bryozoans, water mites (Hydrachnida), and small fishes (mostly sculpins [Cottidae])(Erskine 1972). Erskine's summary should be consulted for further details of the food habits of the Bufflehead.

Although little is known of the food habits of Buffleheads in southeastern waters, presumably the foods eaten there are similar to those consumed elsewhere. Quay and Critcher (1965) gave the sole report of stomach contents taken entirely within southeastern waters. They reported that five Buffleheads wintering on Currituck Sound, North Carolina, had eaten 54.6% (by volume) plant material. The most important foods were pondweeds (*Potamogeton* spp. - 28.6%) and widgeongrass (*Ruppia maritima* - 12.6%); southern naiad (*Najas guadalupensis* - 2.0%) was considerably less important. Quay and Critcher did not indicate what kind of animals were eaten.

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Egg-laying begins in late April in the southern parts of the range but occurs later farther north. The most northern populations begin laying about mid-May. The period of peak laying ranges from early May to mid-May from southern to northern parts of the range. Almost all laying is completed by mid-June throughout the range (Bellrose 1976).

Mean Clutch Size In studies summarized by Erskine (1972) of 263 nests, the mean clutch size was 8.75 eggs; 9 eggs is the most common size. Mean clutch size was smallest (7.00, n = 5) in southern localities (California, Oregon), and largest (9.00, n = 18) in northern localities (Alaska).

Incubation Period Incubation periods ranged from 28 to 33 days in British Columbia (Erskine 1972).

Hatching Success In Erskine's (1972) study in British Columbia, some eggs hatched in 75-80% of all nests; in these successful nests, about 90% of the eggs laid were hatched. The average production from successful nests was 8 chicks, which represented a loss of less than one egg per nest.

Fledging Success "Probably only about one-half of hatched young survive to flight" (Erskine 1972).

Age at Fledging Young Buffleheads are capable of flight at 50-55 days in British Columbia (Erskine 1972).

Age at First Breeding Buffleheads probably breed for the first time at the age of 2 years (Erskine 1972).

Mortality of Eggs and Young Nests may be destroyed by large predators (bears) or robbed by small ones (mustellids, squirrels). Competitors for nesting cavities (flying squirrels, birds) may cause the loss or desertion of nests and eggs. Some nests are deserted after intrusion by other Buffleheads or by Barrow's Goldeneyes that lay in the same cavity (Erskine 1972). Some young fail to leave the nest cavity or to reach water. Erskine (1972) suggested that large carnivorous fish, especially the northern pike (*Esox lucius*), may take the ducklings.

Renesting There is no good evidence that Buffleheads renest after the loss of a clutch (Erskine 1972).

Maximum Natural Longevity Birds banded in British Columbia have been found alive up to nine years after banding (Erskine 1972). A bird recovered at Sled Lake, Saskatchewan, had reached an age of at least 14 years and 3 months (Clapp et al. in press).

Weight Averaged over the year, male Buffleheads weigh about 1 lb (450 g), and females weigh about 0.73 lb (330 g)(Erskine 1972).

SUSCEPTIBILITY TO OIL POLLUTION

Buffleheads have been involved in a few oiling incidents (Table 12). King and Sanger (1979) suggested that this species may be adversely affected in the waters of the Pacific Northwest, but they thought that the damage probably would not be catastrophic. This species seldom forms large aggregations and is fairly uncommon in much of the southeastern United States. Consequently, we think that there is no major hazard to the Bufflehead population from development of petroleum resources in most of the southeastern United States. Only in the colder waters of North Carolina, the state harboring more wintering Buffleheads than any other in the southeast, are these ducks likely to suffer significant mortality from oil pollution.

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Table 12. Number of dead birds and number and percentage of dead Buffleheads found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Buffleheads	Percentage of Buffleheads	Source
Martha's Vineyard, MA	Feb. 1970	541 (a)	8	1.48	CSLP 1971
Off Eastern Canada	Feb.-Apr. 1970	1,276 (a,b)	8	0.63	Brown et al. 1973
San Francisco Bay, California	Jan. 1971	3,221 (a,c)	7	0.22	Smail et al. 1972
Chesapeake Bay, Virginia	Feb. 1976	30,000 (d)	530	1.80	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (d)	260	2.60	Perry et al. 1979

(a) Total includes only those birds identified to species.
(b) Total includes both live and dead oiled birds
(c) This figure represents birds brought to cleaning/receiving stations.
(d) Figure is an estimate based on counts of dead birds.

1979

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HOODED MERGANSER

(Lophodytes cucullatus)

[DA: Hjelmskallesluger, DU: Kuifzaagbek, FI: Vaippakoskelo, FR: Harle couronne, GE: Kappensager, IT: Smergo americano, SP: Serreta cabezona, SW: Kamskrake]

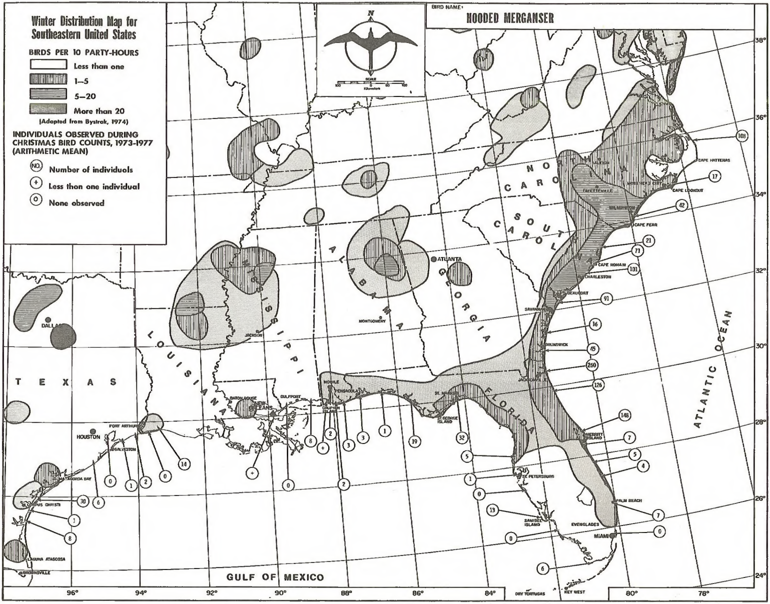
GENERAL DISTRIBUTION

Hooded Mergansers breed in two disjunct portions of North America. A western population nests from southeastern Alaska and southern British Columbia eastward into the Rocky Mountains of Alberta, northwestern Montana and northern Idaho, south through Washington and western Oregon through the Cascades, in the Sierra Nevada to central California, and in the Rocky Mountains to Colorado. The eastern population breeds from southern Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia south through the Mississippi Valley and the Appalachian Mountains, sporadically to Kansas, northern Louisiana, Mississippi, and Alabama (AOU 1957, Bellrose 1976, Palmer 1976b). Nesting is very rare and sporadic on the southeastern coastal plain, but has occurred even to Florida (Sprunt 1954, Repenning and Webster 1978). Both parts of the breeding range may be expanding (Bellrose 1976, Palmer 1976b). Birds from the western region winter in British Columbia, Washington, Oregon, and California, south rarely to Mexico. Those from the eastern region winter on the Atlantic and Gulf coastal plain from New England to Texas, although some occur farther inland, particularly in mild winters (AOU 1957, Johnsgard 1975, Bellrose 1976, Palmer 1976b). Estimates for the total pre-breeding spring population total about 76,000 birds (Bellrose 1976).

The Hooded Merganser is a common migrant and winter visitor in the southeastern states south to central Florida. It is less common in southern Florida, and its relative abundance decreases to the west through Louisiana and Texas (Map 30). It is primarily a bird of inland and fresh water areas, although some occur along the coast. The Hooded Merganser was apparently much more widespread and numerous in earlier days. The species declined with the clearing of bottomland forests and the draining of swamp and marsh land. Since the 1930's, an increase in numbers has been noted, and the more southerly areas are being invaded or recolonized. Much of the nesting in the Prairie States and in the southeast takes place in boxes placed for Wood Ducks (Bellrose 1976, Palmer 1976b). Some nesting has been reported in recent years in all the southeastern states except Texas.

SUSCEPTIBILITY TO OIL POLLUTION

No records of oil pollution of Hooded Mergansers are available. Because the species is seldom found offshore in salt water, the potential for oiling poses little threat to the species in the southeastern states.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
BIRD NAME:
HOODED MERGANSER
N
SCALE
Kilometers
TEXAS
LOUISIANA
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
ATLANTIC OCEAN
GULF OF MEXICO
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
JACKSON
MOBILE
PENSACOLA
DAUPHIN ISLAND
MONTGOMERY
ATLANTA
ST. MARKS
ST. GEORGE ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
PALM BEACH
MERRITT ISLAND
JACKSONVILLE
BRUNSWICK
SAVANNAH
BEAUFORT
CHARLESTON
CAPE ROMAIN
CAPE FEAR
WILMINGTON
FAYETTEVILLE
RALEIGH
MOREHEAD CITY
CAPE LOOKOUT
CAPE HATTERAS
DRY TORTUGAS
KEY WEST
108
17
42
21
71
101
91
16
45
250
126
148
7
5
4
7
0
6
0
13
0
1
5
32
19
1
3
3
2
+
2
8
0
+
14
0
2
1
0
30
6
1
8
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 30

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RED-BREASTED MERGANSER

(Mergus serrator)

[DA: Toppet Skallesluger, DU: Middeleste Zaagbek, FI: Tukkakoskelo, FR: Harle huppe, GE: Mittelsager, IC: Toppond, IT: Smergo minore, JA: Umi aisa, NW: Siland, PO: Tracz dlugodzioby, PR: Merganso, RU: (Long-nosed Merganser), SP: Mergansar de pecho, Serreta mediana; SW: Smaskrake]

GENERAL DISTRIBUTION

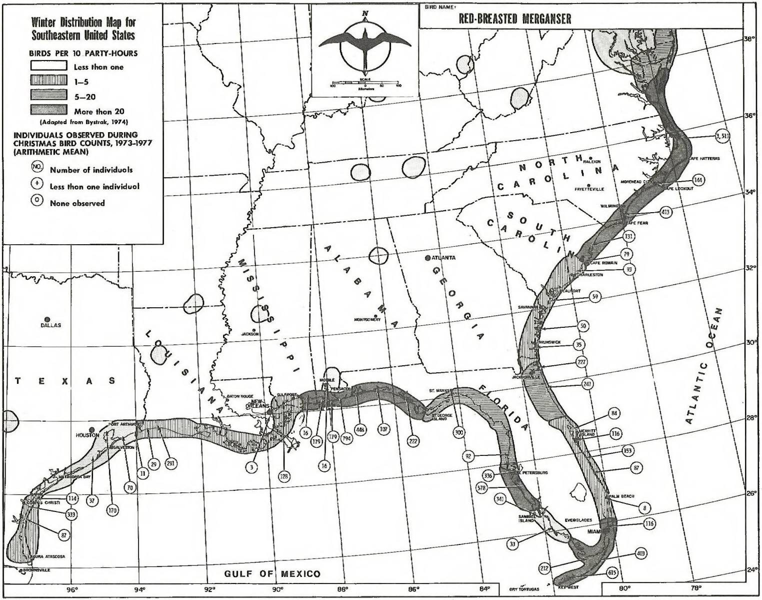
North America Red-breasted Mergansers breed from the Aleutian Islands, Alaska, and the Yukon east across northern Canada, and south to northern British Columbia and Alberta, central Saskatchewan, southeastern Manitoba, northern Minnesota, central Wisconsin and Michigan, southern Ontario and Quebec, northern Maine, and the Maritime Provinces. They occur on southern Baffin Island, but not on most other islands of the Canadian Arctic Archipelago or in the in the northeastern Northwest Territories (AOU 1957, Palmer 1976b).

These ducks winter mostly on salt water from the southern portions of their breeding range south along the North American coastline to Baja California, Sonora, central Arizona and New Mexico, and the Gulf coast. Inland, they winter in the Great Lakes States, along the St. Lawrence River, and sparsely elsewhere. They are accidental visitors in the Hawaiian Islands, Bermuda, the Bahamas, Cuba, and Puerto Rico (Palmer 1976b).

World Distribution The breeding range of the Red-breasted Merganser extends from Greenland, Iceland, parts of the British Isles, Denmark, Norway, Sweden, Finland, and Estonia east across northern Europe and Asia, and south to the Baltic coast of Germany, Poland, central Russia, Lake Baikal, Manchuria, and Kamchatka (Dement'ev and Gladkov 1952, Delacour 1954, AOU 1957, Cramp et al. 1977). Red-breasted Mergansers winter chiefly along coasts from southern Greenland, Iceland, the British Isles, Scandinavia, the North Sea, the Bay of Biscay, and the Mediterranean and Black sea coasts east to Pakistan, the China coast, Japan, and Kamchatka (Dement'ev and Gladkov 1952, Delacour 1954, Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina Pearson et al. (1942) considered the Red-breasted Merganser a common winter visitor, arriving mainly in October along the coast and departing in April, although some remain until June. They are most common along the coast, especially in the Cape Hatteras region (Map 31), but may be seen throughout the state. North Carolina evidently harbors one of the largest populations of wintering Red-breasted Mergansers in the southeast. A concentration of perhaps 10,000 of these mergansers was seen off Nags Head, 3 February 1972 (Teulings 1972b), and Bellrose (1976) reported average winter populations of 11,500 in Albemarle and Pamlico sounds.


Winter Distribution Map for Southeastern United States
BIRDS PER 10 PARTY-HOURS
Less than one
1–5
5–20
More than 20
(Adapted from Bystrak, 1974)
INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
Number of individuals
Less than one individual
None observed
N
SCALE
Kilometers
BIRD NAME:
RED-BREASTED MERGANSER
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
CAPE HATTERAS
MOREHEAD CITY
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
MERRITT ISLAND
PALM BEACH
EVERGLADES
MIAMI
KEY WEST
DRY TORTUGAS
SANIBEL ISLAND
ST. PETERSBURG
ST. MARKS
ST. GEORGE ISLAND
ATLANTA
MONTGOMERY
JACKSON
MOBILE
PENSACOLA
GULFPORT
NEW ORLEANS
BATON ROUGE
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
3,511
144
413
131
79
93
59
50
35
227
241
84
116
153
87
8
116
403
615
212
33
341
578
336
92
300
222
107
448
794
179
16
179
16
128
3
291
29
11
70
170
37
114
333
87
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 31

Red-breasted Mergansers have bred at least once in North Carolina, well south of their normal range. A pair with a brood of seven young was present at Pea Island during the summer of 1956 (Chamberlain and Chamberlain 1956). Needham (1968) saw an immature Red-breasted Merganser at Wrightsville Beach on 28 June 1967 but never saw the parents. The identification remains in doubt because young Red-breasted and Common Mergansers are very similar in appearance (Palmer 1976b) and because Needham gave no basis for the identification. Another flightless young merganser was seen at an impoundment near West Onslow Beach on 6 July 1970; it was identified as a Red-breasted Merganser (Teulings 1970b), perhaps because a bird believed to be a female Red-breasted Merganser had been seen there on 10 June.

South Carolina These mergansers are one of the most numerous winter wildfowl in South Carolina, generally arriving in late October and remaining along the coast until early April; others may stay to summer (Sprunt and Chamberlain 1949). They are most common along the coast (Map 31), but also occur at inland localities. Bellrose (1976) indicated average winter populations of about 1,800 birds off the coast.

Red-breasted Mergansers reportedly bred within South Carolina on at least four occasions, but these records are poorly documented and the bases for specific identification were never given. Burton (1970) stated that "On June 6, 1965, a female with two ducklings was seen sitting on a mudbank opposite Rockville, Charleston County, by T. A. Beckett III. Upon being observed, they took to the water and swam into the nearby marsh. All further attempts to locate them failed." Parnell (1967) noted that during the summer of 1967, "Red-breasted Mergansers were found nesting in the Charleston area for the second year with young birds seen by Beckett." Teulings (1972c), who indicated that the observations were again made by Beckett, stated that "At least 3 pairs of Red-breasted Mergansers were known to have nested successfully in the Charleston area during the summer of 1972."

Teulings (1974c), again basing his statements on observations by Beckett, reported that "...Red-breasted Mergansers were present in small numbers through the period [the summer of 1974] at Charleston where a nesting pair successfully raised a brood of five young on Bohicket Creek....Two families of Red-breasted Mergansers were also seen June 17 at Rockville, S.C."

Other authors (e.g., Johnsgard 1975, Potter et al. 1980) did not question these records of Red-breasted Mergansers in South Carolina but no records were mentioned by Bellrose (1976) or Palmer (1976b); Palmer (1976b) evidently suspected that these records may have been confused with Common Mergansers, "the most likely nester at southerly localities."

Georgia Along the coast of Georgia, Red-breasted Mergansers are fairly common winter residents (Burleigh 1958). They are markedly less common and irregular in appearance throughout the interior of the state. Dates of occurrence range from 4 November (Denton et al. 1977) to 27 May (LeGrand 1979c), with a few remaining in summer.

Florida Sprunt (1954) noted that Red-breasted Mergansers are common winter visitors throughout the coastal regions of both the Atlantic and Gulf portions of the state (Map 31). Howell (1932) noted their presence in Florida from 10 October (St. Marks NWR) to mid-June; the species has since been reported in July (Ogden 1975). Red-breasted Mergansers are now abundant and widespread along both coasts of Florida in bays and open water the length of the state (Kale 1979 ms a, 1979 ms b), but they are more abundant along the Gulf coast (Palmer 1976b, Map 31). Eleven Christmas Counts taken along the Atlantic coast in 1977 totalled about 1,200 Red-breasted Mergansers (Kale 1979 ms a), while sixteen Counts along the Gulf coast totalled nearly 4,500 (Kale 1979 ms b). Flocks ranged in size from a few to more than 100 birds (Kale 1979 ms a, 1979 ms b). One concentration near St. Marks NWR was estimated at 1,500 birds (Stevenson 1976). The Florida winter population was placed at 6,300 by Bellrose (1976).

Alabama Red-breasted Mergansers are abundant along the coast of Alabama in winter and on migration, and they are fairly common inland. They may be present along the Gulf throughout the year but are most abundant from 18 October to 16 May. A maximum concentration of 2,850 Red-breasted Mergansers was seen at Fort Morgan Peninsula, 27 December 1947. They occur casually inland during the summer but are not known to nest in Alabama (Imhof 1976b).

Mississippi The Red-breasted Merganser was the only duck seen every month of the year on the Mississippi coast by Burleigh (1944). The species is abundant from December to March, and flocks of ten or more birds are seen frequently. Scattered individuals are observed throughout the summer (Burleigh 1944, Jackson and Cooley 1978b); Burleigh noticed that these non-breeders are all in first year plumage.

Louisiana This duck is moderately common in Louisiana from the last part of October until the end of April. A few may remain into the summer. They are particularly common in Barataria and Vermilion bays, in Lake Borgne, and in Chandeleur Sound. Red-breasted Mergansers occur primarily on the coastal waterways of Louisiana and are much less common inland (Lowery 1974). Bellrose (1976) reported winter populations of 10,000 birds in Louisiana bays.

Texas The Red-breasted Merganser is a winter visitor in Texas from November to May (extremes, 18 September to 28 May); casual summer lingerers have been reported. This merganser is irregularly very common to fairly common on the upper Texas coast, common to uncommon on the central and lower coast, and uncommon to rare and irregular over the rest of the state (Oberholser 1974). Bellrose (1976) remarked that about 98% of the 1,200 Red-breasted Mergansers found on winter surveys of the Central Flyway are found on the Texas coast.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Red-breasted Merganser breeds in the Western Hemisphere from the Aleutian Islands and the Arctic coast of Alaska east to the western shore of Hudson Bay and southeastern Baffin Island, and south to northwestern British Columbia, central Saskatchewan, the northern Great Lakes States, and the Maritime Provinces (Bellrose 1976, Palmer 1976b). There are scattered reports of casual breeding well south of this area but the validity of at least some of these is doubtful.

In the Old World, these mergansers breed in the northern Palearctic from Iceland, the Faeroes, and the British Isles through Scandinavia, Denmark, and the Baltic States to Russia, northern Siberia, and the islands of the Bering Sea (BOU 1971).

Bellrose (1976) reviewed estimates of populations of North American Red-breasted Mergansers and derived from these a total summer population of 237,000. Population estimates for northern Europe indicate a population of probably not less than 13,000 pairs (Cramp et al. 1977).

Winter In North America, Red-breasted Mergansers winter primarily along the Atlantic, Gulf, and Pacific coasts from open waters of the breeding range south to Baja California and coastal Sonora (Palmer 1976b), coastal Tamaulipas (Saunders and Saunders 1949 in Leopold 1959), and southern Florida (Palmer 1976b).

Bellrose (1976) used Christmas Count figures to estimate the proportions of each species of merganser that were included in the estimates made during January waterfowl surveys. He assigned 67% of the observations to Common Mergansers, 25% to Red-breasted Mergansers, and 8% to Hooded Mergansers. He estimated that a total of nearly 60,000 Red-breasted Mergansers wintered in the four flyways: 38,000 (ca. 64%) in the Atlantic, 14,000 (ca. 24%) in the Mississippi, 6,000 (ca. 10%) in the Pacific, and 1,100 (ca. 2%) in the Central Flyway (Bellrose 1976). About 165,000 mergansers were counted in the contiguous United States during the January 1975 waterfowl survey (Goldsberry et al. 1980). If Bellrose's method of estimation is valid, about 41,000 of these were Red-breasted Mergansers, and more than half of them wintered in the waters off the southeastern states.

Eurasian populations winter south to northern Africa, the Middle East, the China coast, and Japan. About 40,000 winter in western Europe and the British Isles, another 50,000 in the Mediterranean and Black sea regions, and 48,000 pairs in Russia (Cramp et al. 1977).

Migration The majority of Red-breasted Mergansers that breed inland apparently migrate toward the Atlantic or Pacific coasts to reach their principal wintering grounds. A smaller proportion migrate into the Great Lakes region, and from there move to either the Gulf or the mid-Atlantic coast. Those that winter along the Texas coast apparently fly from central Canada south across the Great Plains (Bellrose 1976). Cramp et al. (1977) summarized movements and chronology of migrations for this species in the Old World.

Fall migrants may appear in coastal areas to the north as early as September (Palmer 1976b) but the peak of fall migration along the southeastern coast occurs during the third week of November (Bellrose 1976), with some migrants still moving past mid-December (Palmer 1976b). Spring migration occurs largely from early March through May in the contiguous United States, with peak movement from late March through late April (Palmer 1976b). Flocks of fall migrants may consist of a few hundred birds or more, but flocks of spring migrants are usually smaller (Cramp et al. 1977).

HABITAT

Nesting North American Red-breasted Mergansers breed both inland on lakes, rivers and ponds and along the coasts on shores and on marine islets (Palmer 1976b). Palmer (1976b) described ideal breeding habitat as small islets with low, prostrate vegetation or other natural features to cover the nest, and with open strand, gravel bars, or rocks to provide roosting and preening areas for drakes and young. Johnsgard (1975) noted that Red-breasted Mergansers breeding in northern Europe nest mainly on lakes and rivers that have barren shores and clear water. Cramp et al. (1977) pointed out that the species is largely boreal in its breeding distribution, but also nests to some extent in tundra and temperate forest.

Nest sites of Red-breasted Mergansers are highly varied. They nest in marshes, rocky islets, on vegetated islands in large lakes, on river banks and lake shores, in cavities in banks and under rocks, and beneath piles of driftwood, fallen logs, or conifer boughs (Bellrose 1976, Palmer 1976b). These ducks also have used nest-boxes in Finland (Palmer 1976b). Palmer (1976b) pointed out that overhead cover may be a requirement for nesting and that these ducks prefer to nest on small islands within about 10 m (33 ft) of the edge of the water. A half dozen or more nests may be found near one another; this reflects habitat preference rather than social nesting (Palmer 1976b).

Feeding Johnsgard (1978) reported that wintering Red-breasted Mergansers preferred to forage in clear and shallow waters not affected by heavy waves. Non-breeding Red-breasted Mergansers are often found on less sheltered waters than their congener, the Common Merganser, and are more marine in distribution than that species (Palmer 1976b).

Winter and Offshore Wintering Red-breasted Mergansers are found on both inland fresh waters and coastal marine waters but are found in the largest concentrations along the coasts where they are most common inshore and in tidewater areas (Palmer 1976b). They are found more frequently in open ocean and on salt and brackish bays than on fresh or slightly brackish waters (Johnsgard 1978).

FOOD AND FEEDING BEHAVIOR

Red-breasted Mergansers usually dive for food (Bellrose 1976) but they also pursue prey along the surface with only their heads submerged (Munro and Clemens 1939). The feet provide most of the propulsion but the wings are occasionally used (Palmer 1976b). Most food is brought to the surface to be swallowed, but smaller items are eaten underwater (Cramp et al. 1977). Most feeding dives last for about 10 to 30 sec, with only short pauses between dives (Palmer 1976b). Authors cited in Cramp et al. (1977) and Bellrose (1976) provided a range of submergence times from 15 to 48 sec.

Red-breasted Mergansers feed most actively in the early morning and evening (Cramp et al. 1977) and they often cooperate to drive fish into shallower water where they may be more easily captured (authors cited in Cramp et al. 1977). They feed in pairs and in small and large flocks. Rolls and Rolls (1974) described a behavior in which birds arose from the rear of a flock on the surface of the water, pattered through or flew over the birds in front of them, and then dove into the water, evidently to seize fish. The mergansers that found themselves at the rear of the flock then did likewise. An editorial note pointed out that this may not have been feeding behavior but may have been a form of "diving-play."

Palmer (1976b) and Cramp et al. (1977) provided extensive summaries of foods eaten by Red-breasted Mergansers, and can be consulted for detailed lists of specific organisms eaten. Most of our brief summary of food habits is derived from these two sources.

Red-breasted Mergansers largely feed on fish; one study dealing with food habits in North America indicated that about 87% of the diet was fish, the remainder consisting primarily of crayfish and shrimp. The fish eaten are small, usually less than 8-10 cm in length. Fish making up a significant part of the diet in one part of range or another include Salmon (Salmo salar), sculpins (Cottus asper, C. gobio), blueback herring (Alosa aestivalis), herring (Clupea pallasii), sticklebacks (Gasterosteus spp., especially G. aculeatus), and minnows (Phoxinus). Shrimps eaten include Pandalus and Crago. Other foods taken to a lesser extent include fish eggs, frogs (Rana), annelids, (nereids, Lubricidae), insects (nymphs of dragonflies [Anisoptera], mayflies [Ephemerida], aquatic Coleoptera [e.g., Dytiscus], and larval craneflies [Tipulidae] and caddisflies [Trichoptera]), amphipods (Gammarus), crabs (Carcinus, Lophopanopeus), prawns (Palaemonidae), and molluscs (Hydrobira, Mytilus, Littorina, Cardium, Mya).

Exceedingly little is known of food habits in the southeastern United States. A wintering bird collected in South Carolina contained only top minnows (Gambusia) (Sprunt and Chamberlain 1949).

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying In North America, nests may be initiated in late May, but the season more frequently begins in mid-June. Nests may be started as late as mid-July (Bellrose 1976). The peak of laying in Britain is in May and early June, and in Iceland occurs during the first three weeks of June (authors cited in Cramp et al. 1977).

Mean Clutch Size In North America, nests hold 5-11 eggs, with an average of 7.8 per nest; clutches in Europe average slightly larger (Bellrose 1976). Palmer (1976b) indicated that first clutches usually contain 7-11 eggs. Replacement clutches in Finland averaged 6.2 eggs. Eggs are sometimes laid in dump nests, or in nests of other birds of this or other species (Palmer 1976b).

Incubation Period Bellrose (1976) cited a figure of 30 days for confined birds in England. Palmer (1976b) cited studies of clutches in the wild, with incubation periods from 29 to 35 days, usually 32 days.

Hatching Success Little exact information is available. Many nests are abandoned, and not all eggs hatch in nests that produce young (Palmer 1976b).

Individual broods in North America range from 3 to 13 young, with an average of 7.8 (Bellrose 1976).

Fledging Success Broods of young often combine into large groups (Bellrose 1976, Palmer 1976b), masking the success of individual broods.

Age at Fledging The age at first flight for birds in the wild is not known, but is probably less than the 65 days or more required by the Common Merganser (Bellrose 1976). Heinroth and Heinroth (1928 *in* Palmer 1976b) estimated an age at first flight of 59 days; their estimate was based on observations of captive birds. Cramp et al. (1977) indicated that young achieved independence before this, at about 50 days.

Age at First Breeding Red-breasted Mergansers first breed as they approach two years of age (Palmer 1976b).

Mortality of Eggs and Young Kortegaard (1968) indicated that nests in North Jutland had been destroyed by otters (*Lutra lutra*), rats (*Rattus norvegicus*), foxes (*Vulpes vulpes*), and gulls (*Larus* sp.).

Renesting Bellrose (1976) suggested that renesting is rare because of the lateness of nest initiation, but Palmer (1976b) cited data to suggest it happens frequently in Europe.

Maximum Natural Longevity The oldest bird yet recorded in North America was about 5 years old (Clapp et al. in press), but records from Europe show that Red-breasted Mergansers may attain an age of 9 years, 8 months (Rydzewski 1978).

Weight Nelson and Martin (1953) gave a mean weight of 18 adult males of 2.5 lb (1,100 g) and that of 17 adult females of 2.0 lb (910 g).

SUSCEPTIBILITY TO OIL POLLUTION

Its wintering habitat in coastal marine habitats and its method of feeding (diving, often in flocks) make the Red-breasted Merganser vulnerable to oiling. There are many recent reports of oiled birds, both from the Old and New Worlds (Table 13), but few major losses have been reported. Ranwell and Hewitt (*in* Vermeer and Vermeer 1974) indicated heavy losses following a spill in Poole Harbour, England. Brown et al. (1973) suggested that as much as two-thirds of the Red-breasted Mergansers wintering in Chedabucto Bay, Nova Scotia, died following an oil spill in February 1970. Mortality from oiling has also been recorded in the southeastern United States. Robertson and Mason (1965) found two Red-breasted Mergansers that had been killed by oil at Long Key in the Dry Tortugas in January 1964, and at least two more died from oiling following a spill off Tampa, Florida, in January 1970 (data from the Bird-Banding Office).

King and Sanger (1979) gave the Red-breasted Merganser an Oil Vulnerability Index of 56 (out of a possible 100) for birds in the northeast Pacific. This figure indicated a species that might be affected, but not catastrophically so.

A substantial proportion of the American Red-breasted Merganser population winters in the southeastern United States. We must assume that development of petroleum resources in the southeast presents some hazard to the stability of populations of this species in North America.

Table 13. Number of dead birds and number and percentage of dead Red-breasted Mergansers found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Red-breasted Mergansers	Percentage of Red-breasted Mergansers	Source
North Sea coast, Denmark	1957-1958	92 (a)	3	3.26	Joensen 1972a
Poole Harbour, Dorset, England	Jan. 1961	433 (a,b)	48	11.09	Bourne 1968a
N. Sjaelland, Denmark	Feb.-Mar. 1965	2,340 (a)	55	2.35	Joensen 1972a
Medway Estuary, Kent, England	Sep. 1966	2,748 (a)	1	0.04	Bourne 1968a
Pagham Harbour area, W. Sussex, England	Jan.-Feb. 1967	91 (a,b)	44	48.35	Phillips 1967
Bornholm, Denmark	Jan.-Feb. 1968	466 (a)	1	0.21	Joensen 1972a
Tay Estuary, Scotland	Mar.-Apr. 1968	1,168 (b)	10	0.86	Greenwood and Keddie 1968
N. Sealand, Denmark	Feb.-Mar. 1969	2,376 (a)	48	2.02	Joensen 1972b
Northeast Britain	Jan.-Feb. 1970	10,992 (a,c)	22	0.20	Greenwood et al. 1971
Martha's Vineyard, MA	Feb. 1970	541 (a)	3	0.55	CSLP 1971
E. coast Jutland, Denmark	Feb.-Mar. 1970	1,974 (a)	28	1.42	Joensen 1972b
Off eastern Canada	Feb.-Apr. 1970	1,276 (a,c)	40	3.13	Brown et al. 1973

Table 13. (Continued.)

Area	Dates	Number of oiled dead birds	Number of dead Red-breasted Mergansers	Percentage of Red-breasted Mergansers	Source
S. Kattegat, Denmark	Dec. 1970-Jan. 1971	2,311 (a)	28	1.21	Joensen 1972b
San Francisco Bay, California	Jan. 1971	3,221 (a,d)	6	0.19	Smail et al. 1972
Djursland-Anholt, Denmark	Mar. 1971	239	2	0.84	Joensen 1972b
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	22	0.46	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	5	0.05	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,c)	9	0.23	Gorski et al. 1976
Firth of Clyde, Ayrshire, Scotland	Jan. 1974	279 (a)	6	2.15	Lloyd et al. 1974
Baltic sea coast, Poland	Nov. 1974-Aug. 1975	653 (a,c)	2	0.03	Gorski et al. 1977
Chesapeake Bay, Virginia	Dec. 1976	30,000 (e)	6	0.002	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (e)	30	0.59	Perry et al. 1979
Firth of Forth, southern Scotland	Feb. 1978	680 (a)	4	0.73	Campbell et al. 1978
Varangerfjord, north Norway	Mar. 1979	1,616 (f)	2	0.12	Barrett 1979

(a) Total includes only those birds identified to species.
(b) Total includes both live and dead oiled birds.
(c) Total includes some birds that were not oiled.
(d) This figure represents birds brought to cleaning/receiving stations.
(e) Figure is estimate based on counts of dead birds.
(f) An estimated 10,000 to 20,000 seabirds were killed during this spill.

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COMMON MERGANSER

(*Mergus merganser*)

[DA: Stor Skallesluger, DU: Grote Zaagbek, EN: Goosander, FI: Isokoskelo, FR: Harle bievre, GE: Gansesager, IC: Gulond, IT: Smergo maggiore, JA: Kawa aisa, NW: Laksand, PO: Tracz nuroges, PR: Merganso, RU: (Large Merganser), SP: Serreta grande, SW: Storskrake, US: American Merganser]

GENERAL DISTRIBUTION

North America The Common Merganser breeds from southern Alaska and the southern Yukon east across central Canada to southern and eastern James Bay and across the Labrador Peninsula to Newfoundland, south in the mountains to central California and southern Colorado, occasionally farther south, and east from southern Alberta to the Great Lakes States, northern New York, and New England (Bellrose 1976, Palmer 1976b). They have recently been breeding in small numbers in the upper Delaware River of New Jersey and Pennsylvania, and in the Susquehanna River Valley of Pennsylvania (Boyle et al. 1980).

Most North American Common Mergansers winter from the Pribilof and Aleutian islands, southern British Columbia, Montana, Wyoming, Nebraska, Missouri, the Great Lakes States, the St. Lawrence Valley, Prince Edward Island, and Newfoundland south to southern California, north-central Mexico, and northern Texas, and east to central Georgia (AOU 1957, Bellrose 1976). Small numbers winter farther south to central Baja California, the northern Gulf coast, and southern Florida (Palmer 1976b).

World Distribution Outside North America, the Common Merganser breeds from Iceland, Great Britain, Scandinavia, and the Baltic Sea region south to eastern France, Switzerland, Yugoslavia, and Greece, east across Russia, central Siberia, and Mongolia to Kamchatka and Sakhalin, and from Afghanistan and the Himalayas to Tibet and Altai. They winter on open water in Europe, the northern Mediterranean region, on the Black, Caspian, and Aral seas, the Persian Gulf, northern India, northern Indochina, southeastern China, and Japan (Delacour 1954, AOU 1957, BOU 1971, Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

North Carolina Common Mergansers are uncommon to rare winter visitors in North Carolina, where they are primarily found inland on fresh water. Most are present from November to April (Potter et al. 1980); dates of occurrence for winter visitors extend from as early as 29 October (LeGrand 1979a) to as late as 21 April (Wray and Davis 1959).

The numbers of Common Mergansers that occur along the coast is not well known because some are probably overlooked among the much more abundant and similar appearing Red-breasted Mergansers. LeGrand (1978) noted that this species is more numerous in the Carolinas during very cold winters and reported that 18, which he considered an impressive number, were seen inland on Roanoke Rapids Lake, 22 January 1978.

Common Mergansers have bred at least once in the state but are rarely seen during the summer. A pair nested at Bennett's Pond, Chowan County, in 1938 and another bird was collected at Cape Hatteras on 26 June 1939 (Pearson et al. 1942).

South Carolina Sprunt and Chamberlain (1949) considered the Common Merganser "decidedly uncommon" as a winter resident, recorded between 24 November and April 16. Burton (1970) believed that it might be more abundant than previously thought because females might be confused with the similar but more common Red-breasted Merganser; he remarked that these mergansers were primarily regarded as coastal visitors. Reports of larger numbers have come primarily from inland, however. A flock of 250 or more was seen on 24 September 1961 at Hartwell Lake (Chamberlain 1961). Inlands counts of 22 at Lake Greenwood, 3 February 1977 (LeGrand 1977a), and 16 there 10 February 1978 (LeGrand 1978) were considered "impressive" and "remarkable" by LeGrand.

Georgia In Georgia, this species is an uncommon winter visitor, seen only at infrequent intervals (Burleigh 1958). Denton et al. (1977) considered it rare in the interior and uncommon on the coast, with records from mid-November to mid-April.

Florida This species occurs uncommonly in Florida as a winter visitor (Sprunt 1954). It is found coastally in saltwater bays, lagoons, rivers, and offshore. There were several records for the winter of 1977-78 (Kale 1978, Stevenson 1978). Kale (1979 ms a, 1979 ms b) considered the Common Merganser rare on both the Atlantic and Gulf coasts.

Alabama Imhof (1976b) considered this merganser fairly common to uncommon in winter in the Tennessee Valley but rare and irregular elsewhere in the state. Most are present between late October and late April; dates of occurrence along the coast are from 20 November to 24 April. The largest number reported for the Gulf coast is 10 at Dauphin Island, 27 December 1958 (Imhof 1976b).

Mississippi There are only a few reports of the Common Merganser in Mississippi, all between late December and early February 1977-78, and all from inland lakes (Jackson and Weber 1977, Jackson and Cooley 1978a). The largest number reported is eight at Moon Lake, 4 February 1978.

Louisiana Lowery (1974) regarded the Common Merganser as an uncommon winter visitor in Louisiana, recorded in all months from October through April; there is one record for June. Most of the 37 records are from non-coastal localities but the species has been seen in all coastal parishes. The largest numbers reported have been 21 on University Lake, Baton Rouge, 4 December 1955 (Lowery 1974); and "more than 20" at Calcasieu Lake, 5 December 1970 (Hamilton 1971).

Texas The Common Merganser is a winter visitor in Texas. Oberholser (1974) noted that these ducks are irregularly very common in the northern and middle Panhandle, locally common to scarce in the southern Panhandle and Trans-

Pecos, and scarce to rare elsewhere. Most are present between late October and May, with extreme dates of occurrence of 21 October and 16 June. Summer stragglers are occasionally recorded both inland and along the coast. Oberholser (1974) indicated that most Common Mergansers occur on fresh water, and only a few are seen on brackish inlets and bays.

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding In North America, most Common Mergansers breed from southern Alaska east across Canada to James Bay and across the Labrador Peninsula to Newfoundland, south in the western mountains to California and Colorado, and east to the Great Lakes States and New England (AOU 1957, Palmer 1976b). They occasionally breed south of this range; some records attributed to the more marine Red-breasted Merganser may apply to this species.

Bellrose (1976) estimated that the summer population of Common Mergansers in North America may be as high as 641,000 birds. Johnsgard (1978) cautioned that these estimates are based on uncertain assumptions, and suggested that this figure may be an overestimate. Palmer (1976b) believed that the total population in North America was small compared to populations of other ducks and probably consisted of no more than several hundred thousand birds. The principal breeding grounds are apparently in the closed boreal forest from Alberta to Labrador (Bellrose 1976). Breeding populations are much smaller in Europe and are poorly known elsewhere. Some of the larger breeding populations reported by Cramp et al. (1977) are as follows: 500-1,000 pairs in Great Britain, ca. 4,000 pairs in Finland, 1,300-1,400 pairs in the Baltic area of the U.S.S.R., and 1,500 pairs in Estonia.

Winter Most North American Common Mergansers winter from open waters within the breeding range south to a line extending eastward from southern California through northern Texas to southern South Carolina (Bellrose 1976). Old World populations from some areas (Iceland, Great Britain) largely winter within the breeding range; other populations are more strongly migratory and occur south to the northern Mediterranean, the Caspian Sea area and the Persian Gulf, northern India, southeastern China, and Japan.

Bellrose (1976) estimated that the wintering population of the North American Common Merganser was about 165,000 birds, the majority wintering in the interior of the continent. He indicated that the largest wintering populations were in Oklahoma (30,000 birds), Illinois (ca. 20,000), Ohio (12,000), eastern New Mexico (12,000), Kansas (10,000), Nebraska (9,000), and upstate New York (ca. 6,000). The status of the Common Merganser in the coastal waters of the southeastern United States is inadequately known because of difficulties in distinguishing it from the similar and more numerous Red-breasted Merganser. Bellrose (1976) indicated that Common Mergansers are generally uncommon in the southeast; only a few hundred are found along the Atlantic coast between Virginia and Florida, and less than a thousand winter south of Tennessee and Missouri.

Cramp et al. (1977) listed estimates for wintering populations of Common Mergansers in northwestern Europe: 75,000 in the Europe/Black Sea/Mediterranean region; 10,000 in the Black Sea; and 26,000 in the Caspian Sea region of the U.S.S.R.

Migration Like Old World birds (Cramp et al. 1977), North American Common Mergansers may make either short local migrations or more extensive ones (Palmer 1976b), and migratory pathways are still poorly known. Palmer (1976b) noted that this species usually moves singly, in pairs, and in small groups that tend to remain close to shore along coasts. Timken and Anderson (in Johnsgard 1975) indicated that groups of 8 to 9 birds are usually seen, and that flocks never contain more than 30 birds. Apparently females and young migrate farther than do most adult males (Palmer 1976b); this accounts for the preponderance of sightings of the former in southeastern waters.

In fall this species migrates later than most other ducks. Young and adult females precede adult males by several weeks. On the Atlantic coast, migration peaks in November; in Florida it does not peak until after mid-December (Palmer 1976b). Birds wintering from Mobile to Galveston Bay do not arrive until late December (Bellrose 1976). The spring migration is relatively early, and the age difference in migration is reversed from that found in fall. The spring migration of more southerly wintering birds may begin as early as mid-February (Palmer 1976b), but the peak is in March and may continue into April. Data summarized by Cramp et al. (1977) suggest that these migratory phenomena are similar in Old World birds.

HABITAT

Breeding Palmer (1976b) regarded the Common Merganser as a species that nests primarily in cool, clear waters of northern forests and western mountains. Johnsgard (1975) believed that the preferred nesting habitat was ponds near the upper portions of rivers in forested areas and clear freshwater lakes with forested shorelines. He indicated that Common Mergansers prefer to nest on islands in such situations.

Nests are usually found in holes and concealed recesses. Holes in trees are frequently used (Palmer 1976b). Other sites used include recesses beneath boulders, dark spaces under the roots of fallen trees, crevices in cliffs, areas under dense shrubbery, and hollows in stream cutbanks (Bellrose 1976, Palmer 1976b). Most nests are situated near water (Palmer 1976b) and may be found as much as 50 ft (15 m) up in tree holes (White 1957 in Bellrose 1976).

Common Mergansers also have used a wide variety of artefactual cavities as nest sites. Nest boxes have been used in both the New and Old Worlds. Since the availability of suitable nesting holes is believed to limit distribution (Palmer 1976b), breeding populations of this species in some areas could presumably be increased by providing such sites. Grenquist (1953 in Palmer 1976b) indicated that as many as 63 of 100 nest boxes were occupied during one breeding season in the Finnish Archipelago, and young hatched in 53. Other nest sites provided by man include an abandoned lighthouse tower, bales of hay in an abandoned icehouse, and a stone pier supporting a covered bridge (Bellrose 1976).

Feeding Johnsgard (1975) summarized preferred feeding habitat as fairly shallow waters from 1 1/2 to 6 ft deep. Palmer (1976b) added that Common Mergansers regularly feed in deep or shallow rapids. Most foraging occurs in clear water, because Common Mergansers visually select and follow their prey; most food is taken near the bottom (Palmer 1976b).

Winter and Offshore Dement'ev and Gladkov (1952) stated that the most characteristic winter habitat was the mouths and pre-estuarine regions of rivers. Cramp et al. (1977) indicated that any large body of open water is used, and use of marine waters is only incidental. These authors remarked that Common Mergansers can only be regarded as sea-ducks to a minor degree because they seek out fresh water and may winter inland on almost any large reservoir, lake, or river. Bellrose (1976) indicated that the increase in wintering populations in states such as Oklahoma and Kansas was probably the result of the building of many reservoirs and impoundments. Palmer (1976b) indicated that Common Mergansers are a shoalwater species and thus are usually found near the shore.

FOOD AND FEEDING BEHAVIOR

Common Mergansers principally dive from the surface for their food, propelling themselves with their feet as they chase their prey. They swim with their heads submerged and dive in all but shallow water. Occasionally, these mergansers may "tip-up" to seize prey. They also occasionally probe around near stones near the bottom. Food is occasionally stolen from gulls and they have been observed feeding on dead or dying fish that had been caught in turbines (authors cited in Cramp et al. 1977).

Most dives are shallow but these ducks have been caught as deep as 35-40 ft (11-12 m) in gill nets (Palmer 1976b). Submergence times are usually about 30 sec, but may range up to about 2 minutes. They feed most actively in the early morning and evening. The pattern of feeding behavior may vary from area to area (authors cited in Johnsgard 1975, Palmer 1976b, Cramp et al. 1977). More detailed accounts of feeding techniques and interactions with other species may be found in Johnsgard (1975), Palmer (1976b), and Cramp et al. (1977).

Various studies (e.g., Johnsgard 1975, Palmer 1976b) agree that Common Mergansers are opportunistic feeders. They feed on whatever is most plentiful and most easily available, primarily fish. Recent summaries (Johnsgard 1975, Bellrose 1976, Palmer 1976b, Cramp et al. 1977) indicate that as little as 75% of the diet may consist of fish but often all food identified is fish. A great variety of fish are consumed; Palmer (1976b) indicated that this merganser is known to eat at least 50 species of fish. Other food items ingested include fish eggs and fry, frogs (Rana), salamanders (Ambystoma), crustaceans (shrimp, crayfish, crabs), molluscs (mussels, crabs), insects and their larvae, and nereid annelids (authors cited above). On rare occasions they have been known to eat birds and they occasionally even eat Water Shrews (Neomys fodiens) and water snakes (Cramp et al. 1977).

The authors cited above provide exhaustive lists of species eaten. Their summaries, as well as the papers cited therein, should be consulted for further details. Hansen (1978c) and Anderson and Reeder (1977) give more recent information on food habits than that provided by the handbooks; we do not summarize these here because their papers shed no light on food habits in the southeastern United States.

SUSCEPTIBILITY TO OIL POLLUTION

Small numbers of Common Mergansers have been involved in oil spills (Table 14). King and Sanger (1979) suggested that this species is moderately vulnerable to oiling along the northern Pacific coast of North America. The fact that these ducks are uncommon in southeastern waters and prefer fresh water implies that they would not be adversely affected by offshore development of petroleum resources.

Table 14. Number of dead birds and number and percentage of dead Common Mergansers found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Common Mergansers	Percentage of Common Mergansers	Source
Northeast Britain	Jan.-Feb. 1970	10,992 (a,b)	1	0.009	Greenwood et al. 1971
North-central Kattegat, Denmark	Mar. 1972	4,759 (a)	2	0.04	Joensen and Hansen 1977
Waddensea, Denmark	Dec. 1972	9,151 (a)	1	0.01	Joensen and Hansen 1977
Baltic sea coast, Poland	1970-1974	3,867 (a,c)	1	0.03	Gorski et al. 1977
Chesapeake Bay, Virginia	Feb. 1976	8,385 (a)	11	0.13	Roland et al. 1977
Chesapeake Bay, Virginia	Feb. 1978	10,000 (c)	39	0.39	Perry et al. 1979

(a) Total includes only those birds identified to species.
(b) Total includes some birds that were not oiled.
(c) Figure is estimate based on counts of dead birds.

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MASKED DUCK

(Oxyura dominica)

[EN: Quail Duck, FR: Canard masque, Canard zombie, Canard routoutou; GE: Maskenruderente, SP: Pato dominico, Pato chorizo, Pato chico, Pato criollo, Pato espinoso, Pato codorniz, Pato agostero]

GENERAL DISTRIBUTION

The Masked Duck is primarily a species of the West Indies and northern South America. It occurs in the Lesser Antilles, Trinidad and Tobago, and in South America east of the Andes from Colombia to northern Argentina, Uruguay, southern Bolivia, and southeastern Peru. It has occurred one or more times in all the states bordering the Gulf of Mexico (except Mississippi), and as a straggler north to Wisconsin and Massachusetts (Johnsgard and Hagemeyer 1969). It is resident locally from coastal Texas (uncommonly) and Nayarit south through Mexico and Central America to Panama, and in the Greater Antilles, but is rare east of Hispaniola (AOU 1957, Bond 1971).

There are single records of the Masked Duck in Georgia (Johnsgard and Hagemeyer 1969) and Alabama (Imhof 1976b). The species has been recorded frequently in Florida, with annual appearances since 1973 and as many as nine reported at once. Owre (1962) suggested that the species might be more frequent in Florida than previously recognized. The record tends to bear this out, and a nesting record there in the near future would not be surprising. We know of six records of the Masked Duck in Louisiana, and Lowery (1974) predicted that "it will sooner or later be found to nest in southwestern Louisiana."

The history of occurrences of the Masked Duck in Texas, including the first two verified nestings, was summarized through 1968 by Johnsgard and Hagemeyer (1969). Oberholser (1974) extended the record into 1970, and noted three records of breeding in the 1930's. Small numbers of Masked Ducks were seen in each year of the past decade in counties along or near the southern Gulf coast. Definite nesting areas in recent years are Anahuac NWR, Chambers County; Falfuttias, Brooks County; Welder Wildlife Refuge, San Patricio County (Johnsgard and Hagemeyer 1969, Oberholser 1974); and Brownsville, Cameron County (Webster 1978a).

SUSCEPTIBILITY TO OIL POLLUTION

We have no information that oiling has affected Masked Ducks. Because of the limited distribution and rarity of the species in the southeastern states, and because of its preference for inland waters, the Masked Duck is not likely to be greatly affected by oiling incidents.

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RUDDY DUCK

(Oxyura jamaicensis)

[DU: Rosse Stekestaart, FR: Erismature roux, Erismature joues blancs; GE: Schwarzkopf Ruderente, SP: Malvasia canelo, SW: Amerikansk kopparand]

GENERAL DISTRIBUTION

North America The Ruddy Duck breeds from north-central British Columbia, northern Alberta, central Saskatchewan, and southern Manitoba south to southern California, central Arizona, northern New Mexico, and western and southern Texas. Nesting has occasionally occurred in Alaska, the north-central and eastern United States, Florida, Louisiana, southern Baja California, central Mexico, and Guatemala. The species winters from southern British Columbia, Idaho, Colorado, Kansas, the Great Lakes, and Massachusetts south through the United States and most of Mexico into Central America and in the Bahamas (AOU 1957, Bellrose 1976, Palmer 1976b).

World Distribution Subspecies of the Ruddy Duck are resident throughout the West Indies, the Greater Antilles, and the Lesser Antilles south to Grenada, and in the Andes of South America from Colombia to Argentina and Chile (AOU 1957, Meyer de Schauensee 1966, Bond 1971). An introduced population is established in Britain (Cramp et al. 1977).

DISTRIBUTION IN THE COASTAL SOUTHEASTERN UNITED STATES

The Ruddy Duck is common as a migrant and winter visitor in the southeastern states; it breeds regularly in Texas but has been found nesting only rarely elsewhere in the region. The movement of birds from the Caribbean population to the southeastern coast of the United States has not been documented but is a possibility.

North Carolina Ruddy Ducks are common winter residents from October to May along the coast of North Carolina, but are less common inland (Potter et al. 1980). The principal wintering ground along the Atlantic Seaboard extends from Pamlico Sound in North Carolina northward into Chesapeake Bay (Bellrose 1976). The 1975 winter waterfowl survey recorded 9,300 Ruddy Ducks in North Carolina and about another 3,000 were killed there during the preceding hunting season (Goldsberry et al. 1980).

Two pairs nested at Pea Island in 1953 (Wray and Davis 1959) but this seems to be the only record of extralimital nesting in North Carolina. Birds occasionally summer on impoundments or other bodies of water (Teulings 1970a, 1971c, 1972c, 1973b).

South Carolina These ducks are common winter residents in coastal South Carolina and are seldom found in the interior (Sprunt and Chamberlain 1949). Bellrose (1976) estimated a winter population of about 4,000 along the coast.

The 1975 winter waterfowl survey found 1,600 Ruddy Ducks in South Carolina, and about 500 were killed there during the 1975 hunting season (Goldsberry et al. 1980). Burton (1970) listed three instances of breeding within the state, one at Bear's Island Game Management Area, another at Bull's Island, and a third at Magnolia Gardens.

Georgia The Ruddy Duck is fairly common in winter in Georgia, and is found both in coastal areas and inland (Burleigh 1958, Denton et al. 1977). Bellrose (1976) estimated that fewer than 100 winter in Georgia, however, and none were found during the 1975 survey of wintering waterfowl by the U.S. Fish and Wildlife Service (Goldsberry et al. 1980). None were known to have been killed in Georgia during the 1973-1975 hunting seasons (Goldsberry et al. 1980, Larned et al. 1980), and Christmas Bird Counts from 1973-1977 for Sapelo Island and Glynn County averaged only 45 and 105 birds, respectively. Thus, the species is considerably less common in Georgia than in states to the north. A few records of birds in summer suggest that breeding may occur (Denton et al. 1977).

Florida Bellrose (1976) estimated that the winter population of Ruddy Ducks in Florida reaches 11,000 birds; the 1975 January survey found only 2,700 (Goldsberry et al. 1980). Kale (1979 ms a, 1979 ms b) regarded this duck, largely found on fresh water in Florida, as uncommon along the Atlantic coast and most of the Gulf coast. It is more abundant in northern Florida than in the southern part of the state (Sprunt 1954), and reaches its peak abundance inland and along the panhandle. As many as 8,000 to 10,000 were once seen inland on Lake Jackson (Robertson 1971, Stevenson 1971) and winter populations of 7,500 to 8,400 have been recorded at St. Marks NWR (Kale 1979 ms b).

Ruddy Ducks have bred at least three times in Florida. A female with six young was seen near Mayport, Duval County, in June 1964; adults with two young were seen in an abandoned rock quarry near Live Oak, Columbia County, in late May 1976 (Menk and Stevenson 1977); and a pair with young was seen at the site of the Occidental phosphate mine in 1979 (Ogden 1979).

Alabama This bird is a fairly common migrant and winter visitor in Alabama from October to May, mainly on deep ponds in the interior. Breeding birds have not been observed, although some birds have been present through the summer. The largest count along the Gulf coast was of 250 at the Mobile Delta (Imhof 1976b). About 320 were believed to have been killed during the 1974 hunting season (Goldsberry et al. 1980), and about 525 were shot and retrieved by hunters during the subsequent season (Larned et al. 1980). The January 1975 waterfowl survey reported 100 in Alabama (Goldsberry et al. 1980).

Mississippi Ruddy Ducks are reported as regular visitors to the Gulf coast from November to May, but in small numbers (Burleigh 1944). They are apparently more abundant inland, with a count of more than 2,000 at Jackson on 1 January 1977 (Jackson and Weber 1977). Bellrose (1976) reported an average winter population of 8,000; most of these birds were seen at sites well away from salt water. The 1975 winter waterfowl survey recorded 6,600 Ruddy Ducks in Mississippi (Goldsberry et al. 1980). Although birds have spent the summer (Jackson and Cooley 1978a), nesting has not been reported.

Louisiana Bellrose (1976) estimated an average winter population of 13,000

Ruddy Ducks in Louisiana, mostly on lakes associated with the Mississippi River. Only 1,000 were reported on the January 1975 waterfowl survey, but the surveys of both Louisiana and Mississippi were incomplete (Goldsberry et al. 1980). Most Ruddy Ducks are found in Louisiana from November through mid-April, with occasional birds remaining in summer. Nesting occurred near Holly Beach, Cameron Parish, in 1969 and 1970 (Lowery 1974).

Texas Approximately 6,000 Ruddy Ducks winter along the Gulf coast of Texas, with a slightly smaller number in the northwestern part of the state (Bellrose 1976). Goldsberry et al. (1980) reported 3,230 wintering in Texas during the 1975 waterfowl survey. The species breeds along the coast and at scattered inland localities in the central part of the state (Meitzen 1963, Oberholser 1974).

SYNOPSIS OF PRESENT DISTRIBUTION AND ABUNDANCE

Breeding The Ruddy Duck nests in western Canada from north-central British Columbia, Alberta, central Saskatchewan, and southern Manitoba south in the western United States through most of Washington, Oregon, western Idaho, and central California and in the Plains States through northern Montana, the Dakotas, western Minnesota and Iowa, Nebraska, western Kansas, western Oklahoma, and central Texas, and into the mountains of Wyoming, Colorado, New Mexico, and Arizona. There are records of sporadic or occasional nesting from Maine to Florida in the east, and from Alaska to Mexico in the west. Bellrose (1976) estimated an average breeding population of 595,000 birds for North America over the years 1955-73. Individual surveys of the North American breeding grounds in 1976 (Larned et al. 1980) totalled about 277,000 birds; this figure is probably low, since some parts of the breeding range were not surveyed.

Palmer (1976b) pointed out that the Ruddy Duck was formerly much more numerous and that numbers declined greatly during the early part of the century as a result of market shooting. He also remarked that the current and continuing loss of breeding habitat would prevent this species from ever attaining its former abundance and suggested that the total continental population of Ruddy Ducks was no more than a few hundred thousand birds at best.

The size of populations breeding elsewhere are, in general, poorly known. We have no adequate information on the size of South American and West Indian populations; Hudson (1976) reported that the feral population in England consisted of 40-45 pairs in 1974.

Winter Calculations based on Bellrose's (1976) data indicate a North American winter population of about 232,700 birds. About 55% of these winter in the Pacific coastal states and western Mexico (ca. 136,650 birds), most of these in California. Another 20% (ca. 36,000 birds) winter in the interior of the continent, and about 25% (60,000 birds) winter along the Atlantic coast. Most of the latter population is concentrated in an area from Chesapeake Bay to Pamlico Sound, frequenting brackish estuarine waters. Florida (11,000), Louisiana (13,000), and coastal Texas (6,000) harbor large winter populations of Ruddy Ducks (Bellrose 1976).

The 1975 mid-winter waterfowl survey (Goldsberry et al. 1980) recorded about 152,600 wintering Ruddy Ducks in the United States and Mexico; an estimated additional 64,500 had been killed during the preceding hunting season. Of those surveyed, 43% were in the Pacific Flyway, 2% were in the Central Flyway, 7% were in the Mississippi Flyway, 39% were in the Atlantic Flyway, and 9% were in Mexico. About 16% (ca. 24,500 birds) wintered in the southeastern United States. The largest wintering populations were in California (ca. 54,250 birds), Maryland (25,500), North Carolina (9,300), and Oregon (8,300). Audubon Christmas Bird Counts (Map 32) suggest that larger winter concentrations occur in southern Florida and Texas.

Wintering populations elsewhere are not well known. Palmer (1976b) cited Leopold's (1959) observation in 1952 of an estimated 107,700 Ruddy Ducks just west of Acapulco in Guerrero, Mexico, and remarked that this population may have have then represented more than a third of the entire North American population. Unknown numbers winter in and perhaps south of Guatemala. Winter surveys in the Caribbean have revealed about 100 birds (Bellrose 1976). The post-breeding population of introduced Ruddy Ducks in England numbers in the low hundreds (Hudson 1976).

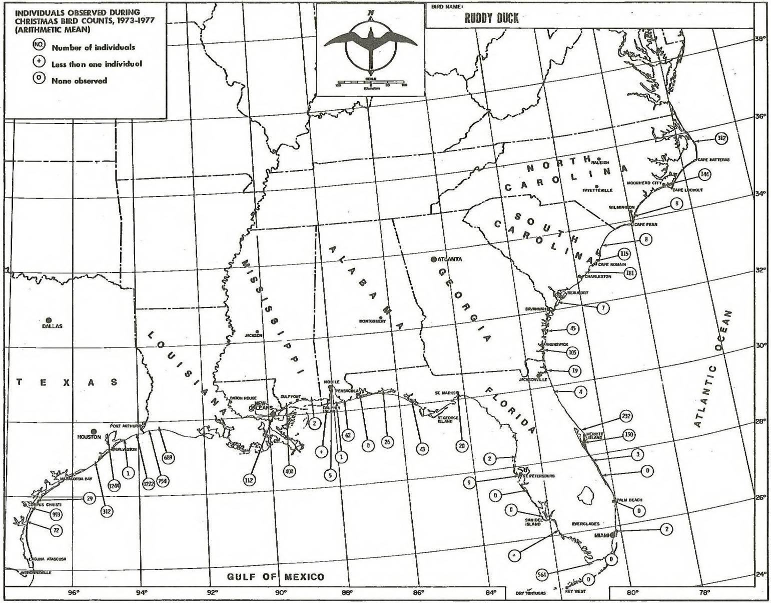
Migration Birds from the prairies tend to move to the coasts, particularly the Pacific coast, funnelling into three major areas--the Great Salt Lake of Utah, Minidoka NWR near Rupert, Idaho, and the Klamath Basin of California. From these areas the birds move on to southern California and western Mexico. Birds from the north central prairie states may move eastward to the Chesapeake Bay or New England. Some apparently move directly south across the Great Plains (Bellrose 1976).

Within the contiguous United States spring migration occurs from early March into May. Dispersal in the fall may occur as early as August but the primary movement to the wintering range occurs from early September to early December, with a peak in October. Ruddy Ducks wintering in Mexico arrive later and depart earlier than do birds wintering farther north (Palmer 1976b). Most migration occurs at night in small flocks of five to fifteen birds (Bellrose 1976).

HABITAT

Nesting Ruddy Ducks nest in emergent vegetation in water about a foot deep at the edges of prairie marshes (Bellrose 1976). Cattail (Typha), bulrush (Scirpus), whitetop (Scolochloa), and reeds (Phragmites) are all used when available (Bellrose 1976, Palmer 1976b). They nest on both large and small marshes that range from potholes of less than an acre in extent to 1,200-acre sloughs. The nest may be either a floating platform of vegetation or a platform built up from the floor of the marsh. Nests also may be placed on old muskrat (Ondatra zibethica) lodges or feeding platforms or on old coot (Fulica americana) nests. Nests may be found either near shore or far from it, at the edge of the marsh or concealed well within it (Bellrose 1976, Palmer 1976b, and authors cited therein).

Feeding On the breeding grounds in southern Manitoba, Ruddy Ducks prefer to feed in areas of shallow water near the edges of ponds (Siegfried 1973c).


INDIVIDUALS OBSERVED DURING CHRISTMAS BIRD COUNTS, 1973-1977 (ARITHMETIC MEAN)
(NO.) Number of individuals
(+) Less than one individual
(0) None observed
BIRD NAME:
RUDDY DUCK
N
SCALE
Kilometers
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
LOUISIANA
TEXAS
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
RALEIGH
FAYETTEVILLE
CAPE HATTERAS
MOORHEAD CITY
CAPE LOOKOUT
WILMINGTON
CAPE FEAR
CAPE ROMAIN
CHARLESTON
BEAUFORT
SAVANNAH
BRUNSWICK
JACKSONVILLE
ATLANTA
MONTGOMERY
JACKSON
DALLAS
HOUSTON
PORT ARTHUR
GALVESTON
MATAGORDA BAY
CORPUS CHRISTI
LAGUNA ATASCOSA
BROWNSVILLE
BATON ROUGE
NEW ORLEANS
GULFPORT
MOBILE
DAUPHIN ISLAND
PENSACOLA
ST. MARKS
ST. GEORGE ISLAND
ST. PETERSBURG
SANIBEL ISLAND
EVERGLADES
MIAMI
PALM BEACH
MERRITT ISLAND
DRY TORTUGAS
KEY WEST
312
144
8
8
115
181
7
45
105
19
4
232
150
3
0
0
2
0
0
564
+
0
0
9
2
20
43
26
0
62
1
5
+
2
400
112
689
754
1272
1244
1
29
312
993
72
38°
36°
34°
32°
30°
28°
26°
24°
96°
94°
92°
90°
88°
86°
84°
80°
78°

Map 32

Large bodies of shallow fresh or brackish water are preferred on migration, especially those with areas of aquatic plant growth (Palmer 1976b). Bellrose (1976) indicated that they regularly forage in water 2-10 ft (0.6-3.0 m) deep.

Winter and Offshore Ruddy Ducks winter in ice-free inland waters and in shallow brackish or salt water areas along the coast (Palmer 1976b). Ruddy Ducks wintering in the Chesapeake Bay region are found nearly exclusively on slightly brackish to brackish estuarine bays and apparently only exceptionally on salty estuarine bays; they avoid coastal bays and open ocean (Stewart 1962 in Johnsgard 1975). Johnsgard (1975) thought that "ideal ruddy duck wintering habitat consist[ed] of brackish to slightly brackish estuaries or coastal lagoons of shallow depths."

FOOD AND FEEDING BEHAVIOR

Siegfried (1973c) reported that adult Ruddy Ducks on the breeding grounds in southern Manitoba feed almost exclusively by diving; food is strained from the mud of the pond bottoms. Surface feeding by skimming and straining was also seen, but Siegfried recorded this only 5 times in 810 observations of foraging adults. Young birds also feed mainly by diving but tend to make shallower, shorter dives than do adults. Ruddy Ducks tend to dive obliquely rather than vertically and, like Lesser Scaup, move longer distances from the point of submergence than do Canvasbacks and Redheads. Diving intervals in water 1 m deep averaged 18.6 sec in males, 20.6 sec in females (Siegfried 1973c); the longest diving time recorded for captive birds was 29 sec (Johnsgard 1975). Twenty-five dives by wintering Ruddy Ducks at Brigantine NWR, New Jersey, averaged 19.78 sec and ranged from 17.4 to 21.8 sec (Heintzelman and Newberry 1964). Ruddy Ducks only rarely peck at items on the surface of the water (Siegfried 1973c).

Ruddy Ducks are largely vegetarians but their diet varies with age, season, and location (Bellrose 1976). Adults and young birds in Manitoba feed primarily (90%) on animal foods in the summer, according to Siegfried (1973c). Larval and pupal midges (Chironomus) are the main food items, but other insects, crustaceans, and molluscs are also taken. In other parts of the year, plant foods apparently make up the major portion of the diet. Widgeon grass and pondweeds are the most important food items in winter in Humboldt Bay, California (Yocum and Keller 1961 in Bellrose 1976). Clams and snails are eaten most commonly in the clear brackish bays of the Chesapeake region (Stewart 1962 in Bellrose 1976). Cottam (1939) showed that the overall proportions of food in the diet of Ruddy Ducks was about 72% plant matter and 28% animal matter.

We know of but one study giving details on food habits of Ruddy Ducks in southeastern waters. Quay and Critcher (1965) reported that the food of 75 Ruddy Ducks wintering in Currituck Sound consisted primarily of the seeds of pondweeds (Potamogeton spp. - 23.5% by volume) and widgeongrass (Ruppia maritima - 33.8%). The vegetative parts of Potamogeton (6.4%) and muskgrasses (Characaeae - 4.4%) also were eaten in significant amounts; another 6.0% of the diet consisted of animals, primarily insects (1.4%), amphipods (2.2%), and fish eggs (1.7%).

Further details on specific foods eaten at other times of year and in other areas may be found in Johnsgard (1975), Bellrose (1976), and Palmer (1976b).

IMPORTANT BIOLOGICAL PARAMETERS

Egg Laying Nesting in Iowa and Manitoba began in May with peaks in early (Iowa) or late (Manitoba) June (Low 1941, Bellrose 1976, Siegfried 1976a). Palmer (1976b) noted complete first clutches by late April or early May, while those nesting in the northern tier of states complete clutches from the end of May into June. In some areas of the United States some eggs may be laid as late as mid-July. Eggs have been found in the West Indies from December to May, with a peak in March; birds in South America evidently lay from about November to April (Palmer 1976b).

According to Palmer (1976b), Ruddy Ducks are single-brooded in the northern portion of their breeding range; he suggests that they may often be double-brooded in the southwestern United States and perhaps in Mexico.

Mean Clutch Size Siegfried (1976a) reported that most nests studied in Manitoba contained seven or eight eggs; the mean was about 7.5 eggs. Summarizing several studies, Bellrose (1976) calculated an overall average clutch of 8.05 eggs. The normal range of clutch size is apparently 5-15 eggs (Bellrose 1976, Palmer 1976b). Ruddy Ducks also have "dump nests" in which more than one female may lay eggs. As many as 80 eggs have been found in a single nest (Palmer 1976b).

Incubation Period The incubation period at 6 nests in Iowa was 25 or 26 days (Low 1941); that in 7 nests in Manitoba was 23 days (Hays *in* Bellrose 1976).

Hatching Success Bellrose (1976) summarized studies of 356 nests of which 69.6% were successful in having some young hatch; the average successful nest produced 5.7 ducklings. Palmer (1976b) mentioned 3 studies in which the hatching success in nests in which at least some young hatched ranged from 70.4% to 100%. Low (1941) noted that some females lead the young from the nest before all the eggs hatch; the abandoned eggs may be the latest laid eggs or eggs dumped by other females (Bellrose 1976).

Fledging Success Bellrose (1976) reported a considerable loss in ducklings during development, so that broods nearing fledging averaged only 4.4 young.

Age at Fledging Young Ruddy Ducks could fly at an age of of six or seven weeks in Manitoba (Hays *in* Bellrose 1976). Palmer (1976b) indicated that age at first flight in wild birds was about six weeks.

Age at First Breeding Palmer (1976b) pointed out that there is no definite information on age at first breeding for wild Ruddy Ducks. Bellrose (1976) suggested that some, but not all, Ruddy Ducks begin breeding in the first year but noted instances in which captive birds did not breed until the second or third year.

Mortality of Eggs and Young Low (1941) reported the mink (*Mustella vison*) as a predator on Ruddy Duck nests. Some eggs are deserted as a result of nest parasitism by this or other species (Low 1941) and some are flooded (Siegfried 1976a). Bellrose (1976) suggested that desertion was the major cause of nesting losses in this species, and that flooding was next in importance; he also recorded some loss to predation by crows (*Corvus brachyrhynchos*) and magpies (*Pica pica*).

Renesting Siegfried (1976a) and Bellrose (1976) believed that renesting occurs infrequently; however, replacement of lost clutches has been known to occur occasionally (Hays *in* Bellrose 1976).

Maximum Natural Longevity A Ruddy Duck banded in British Columbia was found in Oregon at a minimum age of 13 years, 7 months (Clapp et al. in press).

Weight Nelson and Martin (1953) gave the average weight of 12 males as 1.3 lb (590 g), and of 17 females as 1.1 lb (499 g).

SUSCEPTIBILITY TO OIL POLLUTION

Ruddy Ducks are frequent victims of oil pollution, often severely so (Table 15). Johnsgard (1978) attributed their decline in numbers in recent years to loss of breeding habitat and to the "periodic losses of large numbers of birds on wintering areas as a result of oil-spill disasters." King and Sanger (1979) felt that although oil spills in the Pacific Northwest would not be catastrophic to the Ruddy Duck population, the species' status should be monitored during the course of programs developing petroleum resources. Because this species prefers fresh or brackish waters, it would probably not be in much danger from oil spills in the marine waters of the southeastern United States; on the other hand, spills into riverine and estuarine situations from holding tanks onshore could cause losses severe enough to significantly threaten the species' North American population. Moderate to major kills of Ruddy Ducks from oil pollution have occurred recently in the Delaware River and Chesapeake Bay, north of the study area. Consequently, we feel that oil pollution within the northernmost part of the study area in North Carolina, particularly Pamlico Sound, could cause severe damage to this species. The effects of oil on Ruddy Ducks wintering in the sheltered waters of the Laguna Atascosa, in Texas, might also be harmful; as many as 45,000 birds winter there (Webster 1971).

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Table 15. Number of dead birds and number and percentage of dead Ruddy Ducks found after major oiling incidents.

Area	Dates	Number of oiled dead birds	Number of dead Ruddy Ducks	Percentage of Ruddy Ducks	Source
San Francisco Bay area, California	Mar. 1937	397 (a)	2	0.50	Aldrich 1938
San Francisco Bay, California	Jan. 1971	3,221 (a,b)	41	1.27	Smail et al. 1972
Delaware River, Pennsylvania	Dec. 1973	4,000 (c)	3,960	99.0	Perry et al. 1979
Delaware River, New Jersey	Feb. 1974	3,500 (a)	3,430	98.0	Perry et al. 1979
Delaware River, Pennsylvania	Apr. 1974	500 (a)	490	98.0	Perry et al. 1979
Delaware River, Pennsylvania	Jan. 1975	2,500 (a)	2,525	99.0	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1976	30,000 (a)	350	1.2	Perry et al. 1979
Delaware River, Pennsylvania	Dec. 1976	2,000 (a)	1,720	86.0	Perry et al. 1979
Chesapeake Bay, Virginia	Feb. 1978	10,000 (a)	90	0.9	Perry et al. 1979

(a) Total includes only those birds identified to species.
(b) This figure represents birds brought to cleaning/receiving stations.
(c) Figure is an estimate based on counts of dead birds.

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This report describes the distribution, abundance, habitat, food habits and other aspects of the life history, and susceptibility to oil of 41 species of waterfowl of the order Anseriformes in the southeastern Atlantic and Gulf of Mexico. Winter distribution maps for the more common species are presented. An extensive, chronological bibliography accompanies each species account. The report is a planning tool for the Bureau of Land Management, other Federal and State agencies, and private companies dealing with oil impacts in coastal waters.

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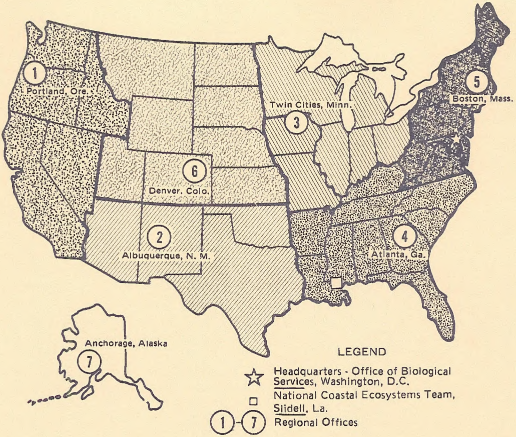
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